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CA FINAL – SCM&PE
VOLUME – III (Version 4)
PRACTICE MANUAL – Ch. 1 to 7

(Notes for Private Circulation only)

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About CA Rakesh Agrawal

- He passed his B. Com examination from Ness Wadia College of Commerce, Pune in 1989 with distinction.
- He was the Captain of his college Chess Team.
- He was adjudged as the Best Mountaineer of the College for 1988 – 89 year.
- He received the Gold Medal from University of Pune in the Special subject of Cost & Management Accountancy at B. Com level.
- He passed his M. Com. Exam also from University of Pune (external), with the specialization in Advanced Cost & Management Accounting. Of course, he again cleared this exam with distinction.
- He cleared his ICWA examination in the first attempt in December, 1990 and stood Third in the Pune Chapter of Cost Accountants.
- He started teaching the subject of Costing at Pune Chapter of Cost Accountants in the year 1991, as a visiting faculty.
- He completed his CA Final examination in November 1992 attempt with 32nd Rank in All India Merit.
- He has cleared Information Systems Auditor (ISA) exam of ICAI in the very first attempt.
- He has passed State Eligibility Test (SET) in Commerce in the very first attempt.
- He has also passed the Mutual Fund exam and Derivatives Core Module, conducted by National Stock Exchange.
- He is the Founder of Vidarbha Professional Academy (1996), Nagpur.
- He has launched a free mobile app titled as "Costing Dictionary by CA Rakesh Agrawal". You may download it from Google Playstore.
- He has an online store **www.carakeshagrawal.in** for e-commerce. Students can buy video lectures from this website and study anytime anywhere.
- He is a Teacher by Passion and Chartered Accountant by Profession.
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- He teaches you a subject for your life time. He also tries to co-relate the subject with day to day life.
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Preface to Practice Manual

Dear Student Friends,

First of all, I would like to thank you for your overwhelming response to the subject of Strategic Cost Management & Performance Evaluation. Many students attended the live or virtual batches of this subject and many more studied this subject through video lectures.

Change is the only Constant in this World. With every passing attempt (i.e. CA Exam), some more questions on the subject gets added in our notes through RTP, Mock Test, ICAI Website and Exam papers. This increases the size of classroom notes as well as teaching duration.

Students expect the faculty to cover everything at one place but that too in lesser duration. It is indeed a difficult task to handle. To cover everything but without increasing classroom duration gave me an idea to come out with Practice Manual.

I have decided to shift all the homework questions and extra questions released by ICAI, in this Practice Manual for the benefit of students. Practice Manual will help you to remain updated and at the same time, it will provide you an opportunity to test yourself at home. Solving the questions **independently** and then checking it with the given solution should help you to boost your confidence.

Due to increase in number of pages, this Practice Manual is now splitted in two parts : (a) Volume III – Covering chapters 1 to 7 and (b) Volume IV – Covering chapters 8 to 13. This Practice Manual is updated up to RTP for May 2021 exam and it also includes the changes made in updated module of ICAI released in Nov. 2020. For subsequent changes and amendments, you may always visit our website www.carakeshagrawal.in. You will find the free downloadable files under the tab 'Students Corner'. This is the only way to update yourself up to your exam attempt. Because, there will always be a gap between attending the lectures and appearing for the actual exam.

One thing I can assure you, that is - After covering our Regular Classroom Notes, Practice Manual and updations from our website or ICAI website, there is nothing left to be covered for this subject of SCM&PE. You don't have to refer multiple books or literature.

Best of Luck and Happy Learning !

CA Rakesh Agrawal

1 INTRODUCTION TO STRATEGIC COST MANAGEMENT

Question 1 : [RTP - MAY 19]

Case Scenario - Porter's Five Forces Model - Industry 'Paper Tubes'

WDG is a family owned business. The family owns 80% of the shares. The remaining 20% is owned by six non- family shareholders. It manufactures Cardboard Boxes for customers which are mainly manufacturers of shoes, clothes, crackers etc. Now, the board is considering to join the Paper Tubes market as well. Paper Tubes, also known as Cardboard Tubes, are cylinder-shaped components that are made with Cardboard. Paper Tubes can be used for a wide range of functions. Paper Tubes are usually ordered in bulk by many industries like - food processing, shipping and the postal service, automotive manufacturing, material handling, textile, pulp and paper, packaging, and art etc. The Paper Tubes cost approximately 1% - 3% of the total cost of the customer's finished goods. The information about Paper Tubes is as follows:

(i) The Paper Tubes are made in machines of different size. The lowest cost machine is of ₹1,89,000 including GST @ 5% and only one operator is required to run this machine. Two days training program is required to enable untrained person to run such a machine efficiently and effectively. A special paper is used in making Paper Tubes and this paper remains in short supply.

(ii) Presently, five major manufacturers of Paper Tubes have a total market share of 75%. They offer product ranges which are similar in size and quality. The market leader currently has 24% share and the four remaining competitors hold on average 12.75% share. The annual market growth is 3% per annum during recent years.

(iii) A current report "Insight on Global Activities of Foreign Based MNCs" released the news that now MNC's are planning to expand their packaging operations in overseas market by installing automated machines to produce Paper Tubes of any size.

(iv) Another company, HEG manufactures a small, however increasing, range of Plastic Tubes which are capable of housing small products such as foils and paper-based products. Currently, these tubes are on an average 15% more costly than the equivalent sized Paper Tubes.

Required :

ASSESS whether WDG should join the Paper Tubes market as a performance improvement strategy?

Solution 1 :

To assess the feasibility of joining Paper Tubes market, Michael Porter's 'five forces model' can be used. It analyses the competitive environment of an industry. It is an important tool for understanding the competitive structure of a particular industry. This complete analysis includes five forces: buyer's bargaining power, supplier's bargaining power, the threat of substitute products, the threat of new entrants and the intra industry competition.

While applying this model to the above case, it can be observed that the low cost of the machine along with the fact that an untrained person will only need two day's training as to be able to operate a machine, will form comparatively low costs of entry to the market. Therefore, WDG may reasonably consider *high threat of new entrants.*

Customer's (buyer) power could be high since customers buy Paper Tubes in bulk along with the fact that there is insignificant difference between the products of alternative suppliers. Paper Tubes cost approximately 1% - 3% of the total cost of the customer's finished goods also indicates that *customer's power is high*.

The fact that the special paper from which the tubes are made remain in short supply, signals *high threat from suppliers*. Hence, suppliers may raise their prices that would result in reduction of profit.

Five major players with 75% market share, offer product ranges which are similar in size and quality, besides, the market is a slow growing i.e. annual growth of 3% p.a., indicate *high rivalry among competitors*.

A *little real threat from a substitute product* exist since HEG manufactures a narrow range of Plastic Tubes. This threat might go up if the product range of HEG is expanded or the price of Plastic Tubes goes down sharply.

Major threat from potential new entrants can be seen, as foreign-based MNCs are planning to joining this market and it seems that these giant corporations might be able to gain economies of scale from automated machines and large production lines with manufacturing flexibility.

WDG might enter this market due to low capital investment but this would also lead to other potential entrants. The easy entry, threat of substitute, the existence of established competitors in the market, the possible entry of a MNCs, and competitors struggling due to slow growth market are putting the potential of WDG into the question to achieve any sort of competitive advantage.

Joining this market might be a good move, if WDG would be able manufacture Paper Tubes at lowest cost within the industry. To assess feasibility, WDG must take into consideration *all possible synergies* between its existing operations of Card Boxes and the proposed operations of Paper Tubes.

From the available information, joining the market for Paper Tubes does not seem to be attractive. Thus, WDG should go for other alternative performance improvement strategy.

Question 2 : [Case Scenario]

Topic : Michael Porter's Five Forces Model

Wireless is a manufacturer of mobile phones. The company operates in a market that is dynamic, extremely competitive and consumer centric. The market is broadly fragmented into those customers who are price conscious looking only for basic features and those who are technology savvy wanting to try out the latest offering. Wireless manufactures phones that cater to both these segments.

Mobile A has the very basic features that a customer requires from a phone. It is marketed to attract the price conscious customers. There are many other manufacturers who have similar product offering for this market. Mobile Z offers the latest technology features and an attractive design. Wireless has invested substantial amount in research and development that has resulted in Mobile Z having many unique features. It is marketed to attract customers willing to try out newer products. The research has also yielded results whereby a large section of the design of Mobile A and Z can be standardized to have a similar components and engineering. This would enable Wireless to enter into agreements with its suppliers to provide components on Just in Time basis. With this change, the quality of Mobile A is expected to improve, thereby improving its sales off take manifold.

Online shopping has given customers complete access to the prices of phones offered by different manufacturers. This channel of shopping contributes to almost 70% of the sales. Huge discounts by its rivals has forced Wireless to reduce the prices of Mobile A as well. This has stretched its profit margins. Various cost reduction measures have been initiated to maintain profitability. Mobile Z on the other hand is currently doing well since it is targeted at a more

niche segment of customers. Wireless is able to charge premium price for Mobile Z. The latest news in the industry of personal devices like mobiles, laptops etc. is the use of Artificial Intelligence and Augmented Reality to enhance user experience. The technical staff at Wireless feel that this could be the next new frontier that could really change the way we use our devices, most of which could even go redundant.

Required :

(i) Identify the strategy that Wireless is using for Mobile A and Mobile Z.

(ii) Discuss the risks involved in each of these strategies.

(iii) Advise Wireless to sustain its current strategy for Mobile A?

Solution 2 :

(i) Wireless is following the "low cost strategy" for Mobile A and "differentiation strategy" for Mobile Z. Mobile A being offered at discounted rates to meet the prices of its competitors. This is being done in order to gain market share from its competitors. To maintain its profitability, Wireless has to find means to keep its manufacturing, distributing and others costs low.

Mobile Z is being perceived by customers as a unique product, with features different from its competitors. This is "differentiation strategy". Differentiation can be achieved from superior product quality, innovation and customer responsiveness.

(ii) The risks involved in a "low cost strategy" for Mobile A is that any price reduction by Wireless will be followed by an equivalent price reduction by its competitors. This price war will ultimately eliminate players who are unprofitable. This strategy will put margins under pressure. The company has to find ways to lower its costs on a sustained basis. The "low cost advantage" will be lost once its competitors find a way to lower their costs as well. The other risk would be to that the quality of the product could be impacted negatively due to lowering of costs.

The risks in differentiation strategy is that it will work only when customers are not price sensitive. The mobile market that Wireless operates is a competitive market. As long as certain customers are willing to pay extra for additional features, Mobile Z will have a competitive advantage. If these customers also become price sensitive, they fail to see the value for paying extra for the additional features. Then the sale of Mobile Z will start falling. The other risk in this strategy would be in the ability of competitors to replicate the features of Mobile Z. Therefore, Wireless should protect its intellectual property rights in order to prevent its competitors from replicating the design and features of Mobile Z. If these risks are contained, then Wireless would be able to maintain its premium price for Mobile Z for its unique features.

An external risk factor for Wireless would also be from the developments in the fields of Artificial Intelligence and Augmented Reality. Wireless has to constantly monitor and assess how these technological developments can impact its business. It must be flexible to adapt to changes as they take place, in order not to become redundant in business.

(iii) "Low cost advantage" can be maintained by copying designs rather than creating them, attaining economies of scale by high volume sales, getting discounts on bulk purchases and gaining from learning curve benefits.

Learnings and experience from research for Mobile Z can be leveraged for Mobile A. Standardization of design for Mobile Z and A would improve the quality of the product since the design is based on a product that has premium range of customers. Since these features can improves the sales of Mobile A, costs would benefit from economies of scale due to larger production volumes.

Bulk purchase of components for Mobile A and Z gives Wireless the advantage in negotiating for discounts on purchases. It could also negotiate for favourable delivery terms, like just in time purchasing agreements. This would reduce the inventory holding costs for Wireless.

All this contributes towards lowering the costs of production of Mobile A. This will help Wireless to sustain its low cost advantage.

Question 3 : [RTP Nov. 2020 + Case Study Digest of ICAI]

BA is the second largest airline in the Country "X". Aviation industry in the Country "X" is growing fast. In 2011, 45 million people travelled to/ from/ or within the Country "X". By 2020 that doubled to 100 million. This number is expected to treble to 300 million by 2030. Also, by 2025, Country "X" is expected to be the third largest air transport market in the world, behind the US and China.

Government is trying to meet the significant growth potential of aviation Industry. However, it will create challenges also for the airline industry and its industry partners.

Government also wants to ensure that broader business and policy environment should not place hurdles which inhibit growth and reduce the level of benefits that aviation can deliver to the nation. The industry, its supply chain partners, and the government and policy makers have a clear mandate to work in collaboration towards the common goal of ensuring that aviation's economic and social benefits are fulfilled.

Despite of operating in World's fastest growing market BA struggles for passengers. Also, BA is facing following problems :

- Aviation Turbine Fuel (ATF) prices constitute about 40% of operational costs in Country "X" and are taxed higher here than anywhere else in the World. The Central government charges 14% duty on ATF. While the state government pile on their own local tax that can go as high as 29%.
- The currency depreciation is hitting Airline harder. About 25% to 30% of their costs, excluding ATF, are dollar denominated, from aircraft lease rents, maintenance costs to ground handling and parking charges abroad etc.
- With the entry of Low Budget Carriers, full-service carrier like BA that have higher overhead costs have been forced to offer discount to passengers looking for great bargain.
- Continuous improvements in tourism infrastructure, tourism policies, human resource development, airport infrastructure density are among the areas that could further enhance Country X's competitiveness. Ease of doing business over the last five years has risen.
- The intense competition among domestic airlines carriers, the need to capture a slice of the ever-expanding market and passenger price sensitivity makes the airlines difficult to raise ticket prices.

Together, these factors have now plunged Country X's aviation industry to its most precarious phase in the last three years or so.

BA is facing huge competition as a "year of sharp U-turns" for X's aviation industry from record profit in Financial Year 2019-20 to mega losses, resulting in direct need of recapitalisation. BA has been appealing to the government for a decade for reduction in taxes on fuel, but all in vain. ATF is 35-40% more expensive in Country "X" than in the rest of the world, because of relatively high tax rates.

Required :

ADVISE the strategy that BA should follow in order to gain superior performance and competitive advantage over its competitors.

Answer 3 :

In consideration to Michael Porter's theory about creating a superior performance and competitive advantage, a firm's overall competitive advantage derives from the difference between the value it offers to customer and its cost of creating that customer value. In order to survive and prosper in industry, firm must meet two criteria – they must supply what customers want to buy and they must survive competition.

To attain superior performance and attain competitive advantage, firm must have distinctive competencies. Distinctive competencies can take any of the following two forms:

Relative low-cost advantage- under which customers gain when a firm's total costs undercut those of its average competitor.

An offering or differentiation advantage- If customer perceive a product or service as superior, they become more willing to pay a premium price relative to the price they will have to pay for competing offerings.

Low Cost Advantage (Cost Leadership)

BA can enjoy relative cost advantage if its total costs are lower than those of its competitors. This relative cost advantage enables a business to do one of the following:

- Charge a lower price than its competitors for its services to gain market share and still maintain current profitability; or
- Match with the price of competing services and increase its profitability.

Cost reductions in BA can be achieved through yield management with variable pricing depending on capacity utilization with careful monitoring; application of computer and communication technology in cost effective way i.e. selling seats via the internet rather than through travel agents; trimming overhead costs by using lower cost out-of-town airports, no printed tickets, seat allocations, or free meals and drinks; efficient operations i.e. fast turnaround times for aircraft to improve utilization; and no exceptions policies to reduce the cost of handling exceptions (e.g. no flexibility for passengers who arrive late). Cost economies can also be realized from large scale operations. However, it is important to note that as soon as more firms strive to become the cost leader, rivalry become so fierce that the consequences for the profitability in the industry are disastrous.

Differentiation Advantage

It occurs when customers perceive that a business service offering is of higher quality, involves fewer risks and/or outperform services offered by competitors. In other words, customers perceive the service offered by a business to be superior. For example, differentiation may include a firm's ability to deliver services, and other factors that provide unique customer value. BA is a multinational passenger airline. It can adopt a differentiation approach by offering passengers a higher-quality experience than many of its rivals. This allows it to charge a premium for its flights compared to many other airlines.

A differentiation advantage can be achieved by offering enhanced features such as prime landing slots can be obtained at major airports around the world; using superior and advantage technology; well-maintained, clean, and comfortable aircraft; training in customer care and the recruitment of high-quality staff; providing complementary services such as in-flight entertainment, high-quality food, and drink. Customer value can also be increased by subjective features such as brand image, advertising based on quality of service provided. However, differentiator cannot ignore its cost position. If costs are too high the premium price are nullified.

On successfully differentiated its offering, management of BA may exploit the advantage in one of two ways viz., either increase price until it just offsets the cost of improvement in customer benefits, thus maintaining current market share; or price below the "full premium" level to build market share.

Alternatively, BA may focus on geographical region and short point to point flights to reduce costs. Michael Porter enlightens focus on attaining low cost or product differentiation for a particular buyer group, segment of product line, or geographic market rather than for the industry

as a whole. The focuser can attain competitive advantage within a niche, because large firms are either not attracted to niche or have ignored the potential. The narrow focus in itself though is not adequate for a competitive advantage. The firms need to optimize the strategy on two variants; cost focus and differentiation focus. One risk of a 'focus strategy' is that broadly targeted competitors devastate the segment once it becomes economically attractive.

In addition, the currency depreciation is hitting Airlines harder and international overhead costs have risen. BA should attempt to increase the number of internal domestic flights. Moreover, ATF cost can also be lowered by investment in fuel saving modern Airbuses. However, the reduction in operating costs may outweigh the capital equipment costs.

To gain competitive advantage, BA may also assess Value Shop Model. Value Shop generates value by organizing resources (e.g. people, knowledge, and skills) and deploying them to solve specific problems. For example, delivering airline services to the passengers or delivering a solution to the business problem. Shops are organized around making executive decisions – identifying and assessing problems or opportunities, developing alternative solutions or approaches, choosing one, executing it and evaluating results.

In this way, the above discussed strategies may be more appropriate for helping BA in achieving superior performance and competitive advantage over its competitors.

Concept in Practice (As an example only for practical insight)

Southwest Airlines (SA) targeted on a geographic region and short point-to-point flights to reduce costs. Even though it offered no-frills service (no frills service is one for which the non-essential features like food, entertainment, printing of boarding pass etc. have been removed to keep the price low) and was based in secondary airports. SA improved quality relative to the limited set of competing alternatives by offering direct flights rather than connecting flights requiring changing planes at large hub airports. The SA also offered better on-time performance and friendly amenities.

Note : The above example is not required to be written by the students in exam. It is provided just to provide you a practical insight from real world.

Question 4 : [RTP Nov. 2020 - Case Study]

Topic : Value Chain Analysis

X is a leading toy manufacturing firm. Having commenced its commercial operations in the year 1990, the firm has a state-of-the-art manufacturing facility in India. It sells toys through retail outlets and the firm's website. X has been pioneering the concepts of quality and safety in toys and has been instrumental in raising the quality standards of toys in the Indian Market.

X's mission is to influence parents to spend on toys that enable every child to grow with quality toys that contributes to his / her wholesome development.

X procures the materials from a number of different suppliers. All of the purchased material are dispatched to its warehouse located at its factory and are held there unless they are moved to production. After production is completed, finished toys are moved to X's retail outlets by its own vehicles. Each week, the vehicles follow the same time schedule regardless of the weight they are carrying. Finished toys that are sold through the X's website are dispatched to its distribution centre.

X has recently got the contract to manufacture a new toy that is 'Ty-Z', a mini cartoon based on a character from a famous international animated film. X has not been given any target price, hence is free to set the selling price of 'Ty-Z'. However, it must pay a royalty of 10% of the selling price to the film director. X is also planning to sell 'Ty-Z' through its retail outlets.

X has decided to follow a target costing technique for 'Ty-Z'. Marketing manager has determined the selling price to be around ₹ 1,750 per 'Ty-Z'. X needs a margin of 26% of the selling price of 'Ty-Z'.

For the estimated costs per 'Ty-Z' refer Annexure given below.

Required :

DISCUSS three primary activities of value chain through which X can minimise cost gap if any.

Annexure

Estimated Costs per 'Ty-Z'

Particulars	₹
Material C	150.50
Material D	122.50
Other Material	See note below
Labour (0.4 hours at ₹ 1,050 per hour)	420.00
'Ty-Z'- specific production overhead cost	132.30
'Ty-Z' - specific selling and distribution cost	166.60
Note :Each 'Ty-Z' requires 0.70 kg. of 'other materials'. These 'other materials' are procured from a supplier at a cost of ₹ 280 per kg and around 5% of all purchased materials are found to be downgraded.	

Answer 4 :

Workings :

Statement Showing Computation of Cost GAP

Particulars	₹
Sales Price	1,750.00
Less: Royalty @ 10% of sales price	175.00
Less: Profit @ 26% of sales price	455.00
Target Cost 'Ty-Z'	**1,120.00**
Material C	150.50
Material D	122.50
Labour (0.40 hours at ₹1,050 per hour)	420.00
Other Material (0.70 kg x ₹280 per kg) / 0.95	206.32
Production Overheads Cost	132.30
Distribution and Sales Cost	166.60
Estimated Cost 'Ty-Z'	**1,198.22**
Cost Gap (1198.22 – 1120)	**78.22**

In this case, there is a cost gap of Rs.78.22. Where a gap exists between the current estimated cost levels and the target cost, it is essential that this gap be closed. Cost gap can be removed by reducing the cost over all the Value Chain through the development of the spirit co-operation and understanding among all members of organizations associated with the product from suppliers, producers, agents and service providers.

In X's Value Chain, three primary activities are:-

Inbound logistics:

These are activities concerned with receiving, storing and distributing the inputs (raw material) to the production process. The relationship with supplier is a key component in this process. Currently, X procures materials from multiple suppliers and stores these materials in its store. Shifting to a just-in-time (JIT) system technique in procurement of materials could possibly save substantial storage cost, provided the JIT supplier must agree to take the responsibility for the good quality and timely delivery of materials supplied. This will also become a source of savings because downgraded items will be removed. However, X might have to pay additional charges to supplier for JIT purchasing to work.

Outbound logistics:

These activities involve collecting, storing and distributing the products to the customers. At X, scheduled transportation of toys to retail outlets is outbound logistics activity. Potentially, the scheduled transportation of toys to retail outlets every week is not an efficient way. Such deliveries do not consider whether toy is required at retail outlets or not, hence X may possibly deliver toys to those retail outlets that do not need toys and suffer unnecessary transportation costs.

X should plan to implement EDI system(i.e. Electronic Data Interchange) that will help it to improve warehousing and logistics by automatically tracking inbound shipments as well as outbound products. Adopting EDI, X can not only improve processes but also streamline inventory management across many channels. However, it will require setup cost of EDI system and employee training to implement the same.

Marketing and Sales:

Marketing and sales provide the means by which the customers are made aware of the product. At X, the sales of toys via its retail outlets and website are marketing and sales activities.

X is planning to sell 'Ty-Z' via retail outlets. If X sales 'Ty-Z' through its website rather than through retail outlet, significant cost could easily be avoided. Simultaneously, X will be able to expose itself to attract international customers to buy 'Ty-Z' as product is based on character from a famous international animated film.

Overall, X may create a cost advantage by **reconfiguring** the Value Chain. Reconfiguration means structural changes such a new production process, new distribution channels or a different sales approach as discussed above.

* * * * *

2 MODERN BUSINESS ENVIRONMENT

Questions on TQM and Cost of Quality

Question 1 : [RTP - May 2018]

Case Scenario

City Bank is a new banking company which is about to open its first branch in INDIA. City Bank believes that in order to win customers from the market, it needs to offer potential customers a new banking experience. Other banking companies are focusing on interest rates and bank charges, whereas City Bank believes that quality and timely availability of service is an important factor to attract customers.

Required :

EXPLAIN how Total Quality Management would enable City Bank to gain competitive advantage in the banking sector.

Solution 1 :

Total Quality Management is a management philosophy. It concerns itself with managing the processes and people to make sure that the customer is satisfied at each and every stage. This means making the needs of the customer the priority, expanding the relationship beyond traditional services and incorporating the customer's needs in the company's business plan and corporate strategy.

In TQM, the concept of "quality" is perceived exclusively from the reference of the customer. These customers can be internal, such as, those working in another department and there can be external customers who are the end recipients of the product or services. The organisation should attempt for continuous improvement in the quality that it delivers with the ultimate aim of achieving zero defects in this quality.

TQM should be viewed as an investment rather than as a cost that should be minimised. There are many ways in which investment can be made in TQM:

- fine-tuning the product mix, i.e. offering variety of services,
- fine-tuning of the service processes to ensure quality,
- introducing employee development programs with proper training,
- empowering the employees to take quick decisions,
- improving the top management commitment to quality,
- monitoring the employee performances and proper rewarding based on achievements,
- ensuring the customer satisfaction etc.

City Bank could provide its employees with *training* in the technical aspects of banking practice as well as in customer care. Customers would thus get a better service not only technically but also from a customer care perspective. This should lead to smaller customer complaints and greater customer satisfaction. It could also motivate customers to recommend others to use this bank.

TQM also requires City Bank to respond to its customer's requirements immediately, for example by providing more staff to reduce the lengths of queues in festive/ seasonal/ busy time. If Bank could also be opened for longer hours to allow customers to complete their bank related requirements and have meetings with bank employees at a time that is more convenient for the customer, this would lead to more satisfaction to customers.

In long run, if bank continue to follow TQM, the bank would have higher profits and competitive advantage in banking sector despite incurring additional expenditure to improve quality.

Question 2 : Practical Question

Classify the following items under appropriate categories of Quality Costs, viz. Prevention Costs (PC), Appraisal Costs (AC), Internal Failure Costs (IFC), and External Failure Costs (EFC) :

(i) Unplanned Replacement to Customers	(vi) Re–processing of a Loan Operation
(ii) Correction of a Bank Statement	(vii) Product Liability Warranty
(iii) Design Review	(viii) Product Acceptance
(iv) Equipment Accuracy Check	(ix) Wastage of Material
(v) Staff Training	(x) Planned Maintenance of Equipment

(Candidates may opt for the following format and fill in the appropriate Roman numerals under each column)

Costs	PC	AC	IFC	EFC
Q. Nos.				

Solution 2 :

Costs	PC	AC	IFC	EFC
Q. Nos.	(iii), (v), (x)	(iv), (viii)	(vi), (ix)	(i), (ii), (vii)

Question 3 :

TQ Ltd. implemented a quality improvement programme and had the following results:

Particulars	**2007 (Rs. '000)**	**2008 (Rs. '000)**
Sales	6,000	6,000
Scrap	600	300
Rework	500	400
Production inspection	200	240
Product Warranty	300	150
Quality training	75	150
Materials inspection	80	60

You are required to:

(i) Classify the quality costs as prevention, appraisal, internal failure and external failure and express each class as a percentage of sales.

(ii) Compute the amount of increase in profits due to quality improvement.

Solution 3 :

(i) Classification of Quality Costs : **(Figures in Rs. '000)**

Particulars	2007	% of sales	2008	% of sales
Sales	**6,000**		**6,000**	
Prevention Cost :				
Quality training	75	1.25%	150	2.5%
Appraisal Cost :				
Production Inspection	200		240	
Materials Inspection	80		60	
Sub-total	280	4.67%	300	5%
Internal Failure Cost :				
Scrap	600		300	
Rework	500		400	
Sub-total	1100	18.33%	700	11.67%
External Failure Cost :				
Product Warranty	300	5%	150	2.5%
Grand Totals	1755	29.25%	1300	21.67%

(ii) Cost reduction was effected by 7.58% (29.25% – 21.67%) of sales. The increase in profit is by Rs. 4,55,000. [i.e. reduction in cost 17,55,000 – 13,00,000 = Rs. 4,55,000.]

Question 4 :

A company makes a single product which sells at ₹ 800 per unit and whose variable cost of production is ₹ 500 per unit. Production and sales are 1000 units per month. Production is running to full capacity and there is market enough to absorb an additional 20% of output each month.

The company has two options:

Option – I

Inspect finished goods at ₹ 10,000 per month. 4% of production is detected as defectives and scrapped at no value. There will be no warranty replacement, since every defect is detected. A small spare part which wears out due to defective material is required to be replaced at ₹ 2,000 per spare for every 20 units of scrap generated. This repair cost is not included in the manufacturing cost mentioned above.

Option – II

Shift the finished goods inspection at no extra to raw material inspection, (Since defective raw materials are entitled to free replacement by the supplier), take up machine set-up tuning and machine inspection at an additional cost of ₹ 8,000 per month, so that scrap of finished goods is completely eliminated. However, delivery of uninspected finished products may result in 1% of

the quantity sold to be replaced under free warranty due to minor variation in dimensions, which does not result in the wearing out of the spare as stated in Option – I

(i) Using monthly figures relevant for decision making, advice which option is more beneficial to the company from a financial perspective.

(ii) Identify the quality costs and classify them under appropriate head.

Solution 4 :

Quality Cost under Option I :

Particulars	Rs.	Classification
(a) Inspection Cost of finished goods	10,000	Appraisal cost
(b) Variable cost of defective goods [1000 units x 4% x 500]	20,000	Internal Failure cost
(c) Opportunity Cost i.e. loss of contribution on defective goods [1000 units x 4% x 300]	12,000	Internal Failure cost
(d) Repair Cost of Spares $\left[\frac{40\text{ Units}}{20\text{ Units}} \times \text{Rs.}2,000\right]$	4,000	Internal Failure cost
Total Cost	46,000	

Quality Cost under Option II :

Particulars	Rs.	Classification
(a) Inspection Cost of raw material (same)	10,000	Appraisal cost
(b) Machine tuning & machine inspection cost	8,000	Prevention cost
(c) Variable cost of defectives [1000 units x 1% x 500]	5,000	External failure
(d) Opportunity cost i.e. loss of contribution on defectives [1000 units x 1% x 300]	3,000	External failure
Total cost	26,000	

Decision: Considering lower cost of quality, Option II is better.

Question 5 : [MTP – May 2020]

The CEO of P Limited is concerned with the amounts of resources currently spent on customers warranty claims. Each box of its product is printed with the logo : "satisfaction guaranteed or your money back". P is having difficulty competing with X Limited because it does not have the reputation for high quality that X Limited enjoys. Since the warranty claims are so high, the CEO of P Limited would like to assess what costs are being incurred to ensure the quality of the product. Following information is collected from various departments within the company relating to 2018-19 :

Particulars	Rs.
Warranty claims	4,25,000
Employee training costs	1,20,000
Rework	3,00,000
Lost profits from lost customers due to impaired reputation	8,10,000
Cost of rejected units	50,000
Sales return processing	1,75,000
Testing	1,70,000

For the year 2019-20, the CEO is considering spending the following amounts on a new quality programme :

Particulars	Rs.
Inspect raw material	1,20,000
Reengineer the production process to improve product quality	7,50,000
Supplier screening and certification	30,000
Preventive maintenance on plant equipment	70,000

P expects the new quality programme to save costs by the following amounts :

Particulars	Rs.
Reduction in lost profits from lost sales due to impaired reputation	8,00,000
Reduction in rework costs	2,50,000
Reduction in warranty costs	3,25,000
Reduction in sales return processing	1,50,000

Required :

(i) Prepare a Cost of Quality Statement for the year 2018-19 showing the percentage of the total costs of quality incurred in each cost category. [3 Marks]

(ii) Prepare a cost benefit analysis of the new quality programme showing how the quality initiative will affect each cost category. [3 Marks]

(iii) State how the manager trade-off among the four categories of quality costs. [4 Marks]

Solution 5 :

(i) Cost of Quality Statement for 2018-19 :

Particulars	Rs.	% of total cost
Prevention Cost :		
Employee training costs	1,20,000	5.85%
Appraisal Cost :		
Testing	1,70,000	8.29%
Internal Failure Cost :		
Rework	3,00,000	
Cost of rejected units	50,000	
Sub-total	3,50,000	17.08%
External Failure Cost :		
Warranty claims	4,25,000	
Lost profits from lost customers due to impaired reputation	8,10,000	
Sales return processing	1,75,000	
Sub-total	14,10,000	68.78%
Total Cost of Quality	**20,50,000**	**100%**

(ii) Cost Benefit Analysis for 2019-20 :

Particulars	Addl. (Cost) / Savings	Net Effect (₹)
Prevention Cost :		
Reengineer the production process to improve product quality	(7,50,000)	
Supplier screening and certification	(30,000)	
Preventive maintenance on plant equipment	(70,000)	(8,50,000)
Appraisal Cost :		
Inspect raw material	(1,20,000)	(1,20,000)
Internal Failure Cost :		
Reduction in rework costs	2,50,000	2,50,000
External Failure Cost :		
Reduction in lost profits from lost sales due to impaired reputation	8,00,000	
Reduction in warranty costs	3,25,000	
Reduction in sales return processing	1,50,000	12,75,000
Net Savings from new quality programme		**5,55,000**

(iii) Managers Trade off :

Investment in prevention costs and appraisal costs (also known as costs of good quality), reduces internal and external failure costs (also known as cost of poor quality).

Costs incurred before actual production begins, to prevent defects and other product quality issues, are known as preventive costs. In the given example, reengineering production process, screening and certification of suppliers and preventive maintenance of equipment are prevention cots. Likewise, appraisal costs are incurred to ensure that activities conform to desired quality requirements. They are incurred in all stages of production. In the given example, inspection of raw material is an appraisal cost.

Trade off means cost-benefit analysis. A manager has to see how much extra cost he has to incur on Prevention and Appraisal and the resultant savings in Internal and External Failure costs. If the incremental benefit is more than the incremental costs, then it is advisable to implement the new proposal.

In the above example, the extra cost incurred on Prevention is Rs. 8,50,000 and extra cost incurred on Appraisal is Rs. 1,20,000. However, it has resulted in a saving of Rs. 2,50,000 in Internal Failure cost and a savings of Rs. 12,75,000 in the External Failure cost. Thus the net saving due to new quality programme is Rs. 5,55,000.

Hence, it is advisable to implement the new quality programme.

Question 6 : [RTP – Nov. 2019]

H Automobile Group is among top 20 business houses in India. It has been founded in the year 1930, at the height of India's movement for independence from the British, the group has an illustrious history. H's footprint stretches over a wide range of industries, spanning automobiles (two wheelers manufacturer and three wheelers manufacturer). H's headquarter is located at Hyderabad. Bike Production is one of segment of H Group. Management of H wants to analyse the following actual information for the April.

Cost Data :

Customer Complaints Centre Cost	35 per hr.
Equipment Testing Cost	18 per hr.
Warranty Repair Cost	1,560 per bike
Manufacturing Rework Cost	228 per bike

Volume and Activity Data :

Bikes Requiring Manufacturing Rework	3,200 bikes
Bikes Requiring Warranty Repair	2,600 bikes
Production Line Equipment Testing Time	1,600 hrs.
Customer Complaints Centre Time	2,000 hrs.

Additional Information :

Due to the quality issues in the month, the bike production line experienced unproductive 'down time' which cost ₹ 7,70,000. H carried out a quality review of its existing suppliers to enhance quality levels during the month at a cost of ₹ 1,25,000.

Required :

(i) PREPARE a statement showing 'Total Quality Costs'

(ii) ADVISE any TWO measures to reduce the non-conformance cost.

Answer 6 :

(i) Statement Showing 'Total Quality Costs' :

Particulars of Costs	₹
Prevention Costs :	
Supplier Review	1,25,000
Appraisal Costs :	
Equipment Testing (₹ 18 per hr. x 1,600 hrs.)	28,800
Internal Failure Costs :	
Unproductive Down Time	7,70,000
Manufacturing Rework (₹ 228 per bike x 3,200 bikes)	7,29,600
External Failure Costs :	
Customer Complaints (₹ 35 per hr. x 2,000 hrs.)	70,000
Warranty Repair (₹ 1,560 per bike x 2,600 bikes)	40,56,000
Total Quality Costs	57,79,400

(ii) The reporting of quality costs highlights the cost of quality activities at H. The total quality costs statement clearly displays the relationship between conformance costs (prevention and appraisal costs) and non-conformance costs (internal failure and external failure costs) and the drivers of a reduction in the overall spending on quality. Statement indicates that only 2.16% of the total quality cost is the cost of preventing quality problems while 0.50% is the cost of appraisal activities. Thus, prevention and appraisal costs make up only 2.66% of total quality costs. In contrast, 97.34% of quality control costs are incurred for internal and external failure costs. Following two measures can be used to reduce non-conformance cost.

(1) Total Productive Maintenance (TPM) is a system of maintenance and improving the integrity of production and quality system through keeping all equipment in top working conditions so as to avoid breakdowns and delays in manufacturing processes. It involves identifying machines in every division (including planning, manufacturing, maintenance) and then planning & executing the maintenance programme covering their entire useful life.

In this scenario, TPM will help in reducing internal failure cost (i.e. downtime and manufacturing rework cost), which constitutes 25.95% of total quality cost, by keeping all equipment in good working conditions so that there is no downtime or machine breakdown and ensuring that all equipment run smoothly. If machines work properly, the chances of rework will reduce, ultimately it will also reduce chances of warranty repair and customer complaints (comprising 71.39% of total quality cost which is the major part of total quality cost).

(2) Total Quality Management (TQM) aims at improving the quality of organisational output, including goods and services, through continuous improvement of internal practices. Its objective is to eradicate waste and increase efficiency without compromising with the quality. It requires that the company maintains its quality standards in all aspects of business by ensuring that things are done right at the first time itself, so that defects and wastes are eliminated from operation.

It appears that H is not a TQM company at present due to huge disparity between conformance costs and non-conformance costs. In order to make H to be successful, all staff at H must be engaged in the improvement process and share its continuous improvement ethos. In order to establish a reputation as a high-quality bike manufacturer, H must ensure that the staff are focused on quality and attitudes changed towards the importance of conformance activities. For instance, H can conduct third party inspection of raw material at supplier's workplace leading to maintenances of quality standards.

Overall, while applying the above two measures in H, consideration must be given to the optimum balance between the costs of conformance and the costs of non-conformance.

Questions on TOC and TA

Question 7 :

Genex Limited produces 3 products X, Y and Z using three different Machines M1, M2 and M3. Each machine's capacity is limited to 6,000 hours during the production period. The details given below are for the production period :

Particulars		X	Y	Z
Selling Price per unit		₹ 12,000	₹ 10,000	₹ 8,000
Variable Cost per unit		₹ 8,000	₹ 6,800	₹ 6,000
Machine Hours required per unit:	M1	18	12	6
	M2	18	16	8
	M3	20	8	2
Expected Demand (units)		200	200	200

(i) Determine the Bottleneck Activity.

(ii) Allocate the Machine Hours on the basis of the Bottleneck.

(iii) Determine the Unused Spare Capacity, if any, of each Machine.

Solution 7 :

(i) Finding the bottleneck activity –

Particulars	X	Y	Z	Total Hours needed	Total Hours Available	TA Ratio
(a) Expected demand (units)	200	200	200			
(b) M1 hours p.u.	18	12	6			
(c) Total hours of M1 needed [a x b]	3600	2400	1200	7200	6000	120%
(d) M2 hours p.u.	18	16	8			
(e) Total hours of M2 needed [a x d]	3600	3200	1600	8400	6000	140%
(f) M3 hours p.u.	20	8	2			
(g) Total hours of M3 [a x f]	4000	1600	400	6000	6000	100%
Note: Considering highest TA Ratio of 140%, Machine M2 is a bottleneck machine.						

(ii) Statement of Contribution & Ranking:-

Particulars	X	Y	Z
(a) Selling price P.U.	12,000	10,000	8,000
(b) Variable cost P.U.	8,000	6,800	6,000
(c) Contribution P.U. [a – b]	4,000	3,200	2,000
(d) M2 hours P.U	18	16	8
(e) Contribution Per Hour of M2 [c ÷ d]	222.22	200	250
(f) Ranking	II	III	I

(iii) Optimum allocation of Machine M2 Hours:-

Particulars	No. of Units	Hours P.U.	Total Hours	Balance Hours
Total available hours of M2				6,000
Less: Used for Z	200	8	1,600	4,400
Less: Used for X	200	18	3,600	800
Balance hours used for Y	50	16	800	NIL

(iv) Calculation of unused spare capacity of each machine:-

M1 = 6000 – (200 X 18) – (50 X 12) – (200 X 6) = 600 hours

M2 = 6000 – (200 X 18) – (50 X 16) – (200 X 8) = 0 hours

M3 = 6000 – (200 X 20) – (50 X 8) – (200 X 2) = 1200 hours

Question 8 :

A company produces three products A, B and C. The following information is available for a period:

Particulars	A	B	C
Throughput Contribution (Rupees per unit)	30	25	15

Machine hours required per unit of production:

Particulars	A	B	C	TA Ratio
Machine 1	10	2	4	133.33%
Machine 2	15	3	6	200%
Machine 3	5	1	2	66.67%

Estimated sales demand for A, B and C are 500 units each and machine capacity is limited to 6,000 hours for each machine.

You are required to analyse the above information and apply theory of constraints process to remove the constraints.

How many units of each product will be made?

Solution 8 :

Throughout Accounting ratio is highest for 'Machine 2'.

∴ 'Machine 2' is the bottleneck machine.

Contribution per unit of bottleneck machine hour:

	Particulars	A	B	C
A.	Throughput Contribution per unit (Rs.) [given]	30	25	15
B.	'Machine 2' hours per unit	15	3	6
C.	Contribution per Machine hour (A ÷ B)	2	8.33	2.50
D.	Ranking based on (C) above	III	I	II

Removing the bottleneck & calculating number of units of each product:

Particulars	No. of units	M/C hrs. p.u.	Total hours	Balance hours
Total available machine 2 hours				6,000
Less : Used for Product B	500	3	1,500	4,500
Less : Used for Product C	500	6	3,000	1,500
Balance hours used for Product A	100	15	1,500	NIL

Question 9 : [RTP - Nov. 2020]

ZED produces two types of products Z and D at its manufacturing plant. Both the products are produced using the same materials, machinery, and skilled labour. Machine hours available for the year is 4,000 hours. Information relating to products is as follows:

Particulars	Z	D
Selling Price per unit	₹ 16,000	₹ 4,000
Material Costs per unit	₹ 7,000	₹ 1,200
Machine Hours per unit	1.6 hrs.	0.8 hrs.
Maximum Annual Demand	2,000 units	1,600 units
Online Booking (already accepted for)	400 units	1,200 units

Due to poor productivity levels, late order and declining profits over recent years, the CEO has suggested the introduction of throughput accounting in the company.

The total of all factory costs is ₹ 1,42,60,000 excluding material.

Required :

(i) Using throughput accounting, PREPARE statement to determine the optimum production mix and maximum profit for the next year.

(ii) CALCULATE the amount of profit lost due to acceptance of online booking of the products.

(iii) RECOMMEND the options to be followed in order to avoid any loss of profit.

(iv) LIST various ways through which price customization could be done.

(v) Given that products Z and D are respectively in 'maturity stage' and 'introduction stage' of their life cycle. STATE the most appropriate pricing policy that could be followed by the ZED for Z and D as per their life cycle.

Answer 9 :

(i) Statement Showing Machine Hours :

Product	Maximum Demand	Machine Hours / Unit	Total Machine Hours
Z	2,000 units	1.6	3,200
D	1,600 units	0.8	1,280
Total machine hours required to meet maximum demand			4,480
Less : Machine hours available			4,000
Shortage of machine hours			480

Conclusion : 'Machine hours' is the bottleneck activity.

Student Note : In my personal opinion, the above working was not needed.

Statement of Ranking :

Particulars	Z	D
Selling Price per unit	₹16,000	₹4,000
Less: Material Costs per unit	₹7,000	₹1,200
Throughput contribution per unit	₹9,000	₹2,800
Machine Hour Required per unit	1.6	0.8
Throughput contribution per hour	(₹9,000/1.6) = ₹5,625	(₹2,800/0.8) = ₹3,500
Throughput Accounting (TA) Ratio (throughput contribution per hour/ factory cost per hour)	5,625/3,565 = 1.58	3,500/3,565 = 0.98
Ranking	I	II

Factory cost per hour = ₹1,42,60,000/ 4,000 hrs. = ₹3,565

Student Note : In my personal opinion, calculation of TA ratio was not needed. The ranking can be assigned on the basis of 'Contribution per hour' itself.

Optimum Production Plan :

Product	No. of units	Machine hr. per unit	Total M/C hrs.	T/P per hr.₹	Total T/P ₹
Z (online orders)	400	1.6	640	5,625	36,00,000
D (online orders)	1,200	0.8	960	3,500	33,60,000
Z	2,400/1.6 = 1,500	1.6	2,400 (Bal. fig.)	5,625	1,35,00,000
Total T/P Contribution					2,04,60,000
Less: Total Factory Cost (it is like fixed cost)					1,42,60,000
Profit					62,00,000

(i) Had there been no online booking, we would first fulfill entire demand of Z for 2,000 units using 3,200 machine hours (2,000 x 1.6). Because of online booking already accepted for 1,200 units of product D, unfulfilled demand of product Z = 2,000 – 1,900 = 100 units.

Machine Hrs. Required for 100 units of Z (100 x 1.6)	160 hrs.
Throughput Lost for Product Z (160 hrs. x 5,625)	₹ 9,00,000
Throughput Return Earned from Product D (160 hrs. x 3,500)	₹ 5,60,000
Throughput lost	₹ 3,40,000

Student Note : The above calculation of loss of profit can also be calculated using differential approach as :

160 hours x (5,625 – 3,500) = ₹3,40,000

(ii) **Recommendation :**

Option-1

Throughput accounting ratio is the throughput return earned in an hour divided by the factory cost (labour and overheads) incurred by the factory in one hour. Factory cost is generally fixed in nature. A ratio above 1 signifies that the throughput return is greater than the factory cost and therefore the product is profitable. Product Z has a throughput accounting ratio of 1.58 while Product D has a throughput accounting ratio of 0.98.This indicates that hourly return from Product Z can cover the hourly factory cost and thus it is profitable. Product D does not yield enough hourly return to cover the hourly factory cost, hence it is not profitable. Therefore, ZED should consider ways of improving throughput accounting ratio of Product D (i.e. above 1.0). TA ratio could be improved by:

- Increasing the selling price of the Product D but the demand may fall.
- Reducing the material cost per unit as well as operating costs. However, there may be quality issues.
- Improving efficiency e.g. increase in number of units that are made in each bottleneck hour.
- Increasing the bottleneck so that more hours are available of bottleneck resource.

Option-2

ZED has to prioritize production of Product Z since it is more profitable than Product D. As per the throughput accounting ratio, Product D does not yield sufficient return per hour to cover the hourly overhead cost therefore, gets second priority over Product Z.

Since machine hours are the bottleneck, if production for entire 4,000 hours is focused on Product Z, return yielded would be sufficient to cover the factory overheads. However, Product Z has a maximum demand of only 2,000 units, which requires 3,200 machine hours (2,000 units x 1.6 hours). Remaining 800 machine hours can be devoted to Product D, during which 1,000 units can be produced (800 machine hours / 0.8 hours per unit). Maximum demand for Product D is 1,600 units. Therefore, the balance demand of 600 units of Product D will remain unsatisfied.

However, to meet unsatisfied demand of Product D, ZED may consider the option of sub-contracting either in part or whole of the production of Product D. This way it can meet the entire demand for Product D for 1,600 units. If it subcontracts the entire production of Product D, it can also scale down its in-house capacity. Sub-contracting decision requires suitable cost benefit analysis. Moreover, the risk associated with outsourcing like unsatisfactory quality and service or failure of supplier cannot be ignored.

Overall, to enhance profitability or avoid any type of loss of profit, ZED may consider the options recommended above with a long term perspective.

(iii) Pricing of a product is sometimes customized keeping taste, preference and perceived value of a customer into consideration. Price customization is done in the following ways:

- Based on product line: When products are customized as per the customer's requirements, pricing can be adapted based on the customer's specifications. Standard products can have a base price, to which the company can top-up charges to any additional customization.

- Based on customer's past behavior: Customers with good payment record have established their credit-worthiness. To sustain business, they may be extended additional discounts as compared to other customers.

- Based on demographics: Different pricing strategies may be adopted based on age or social status. For example, railway fare discounts for senior citizens or concessional price tickets for military personnel.

- Based on time differential: Different price for different time periods. If a customer extends a long-term contract, an additional discount may be extended since business is contracted for a longer period of time. Example, discounted price for data usage provided by a broadband service provider if subscription is paid for six months or more.

(iv) The life-cycle of a product has 4 stages namely : Introductory stage, Growth stage, Maturity stage and Decline stage.

Product Z is given to be in the maturity stage. The third stage of product life cycle is characterized by an established market for the product. After rapid growth in sale volume in the previous stages, growth of sales for the product will saturate. Competition would be high due to large number of rivals in the market, this may lead to decreasing market share. Unit selling price may remain constant since the market is well established. Occasional offers may be used to tempt customers, otherwise this stage will mark consolidation of the market.

Product D is in the introduction stage, the first stage of product life cycle. Penetration pricing is adopted to charge a low price in the initial stage for penetrating the market as quickly as possible. For a new product this low price strategy will popularize the product. Once the market is established, the price may be increased. Penetration pricing will be suitable when:

(i) Demand for the product is elastic, i.e. more demand when prices are low.
(ii) Large scale production of the product yields economies of scale.
(iii) Threat of competition requires prices to be set low. It serves as an entry barrier to prospective competitors as well.

However, if Product D is a highly innovative product, it may adopt Skimming pricing policy. The product with unique features will differentiate it from other products leading to a revolutionary impact on market and customer behavior. Customers may not mind paying a premium for the unique product offering. Focus may be on promoting the product to gain market share. Skimming pricing policy may work when :

(i) There seem to be no competitors providing similar products.
(ii) Demand is inelastic.

Over a period of time, competitors can do reverse engineering and offer similar products. Therefore, the price may be lowered in the long run to retain market share.

Case Study on Supply Chain Management

Question 10 :

Sun Electronics manufactures and sells various electronic goods like mobile phones, laptops, televisions, refrigerator etc. The company sells these goods through the 30 stores situated in different parts of the country. The store managers place a request to the centralised team situated in Mumbai on a monthly basis. One store can send only one requisition per month.

The requirements of the stores are forwarded to the production planning team which is responsible for scheduling the manufacturing of these products. Once the goods are manufactured, the goods are sent to a central warehouse in Mumbai and are dispatched to different stores according to the store requirements. The time taken from placing a request from store to the delivery of product to the store takes about 30-40 days on an average. In the process the company procures parts from more than 100 vendors. The company has faced quality related issues with many vendors leading to delay in production.

The average holding period of inventory in Sun Electronics is very high at 45 days as against an industry average of 15 days. Since the order to delivery time at a store is very high, the company has traditionally allowed high inventory holding to reduce the stock outs at store level. The company is under severe pressure to improve its working capital cycle.

A high amount of inventory held at each store also means that the products become obsolete quickly. In case of products like mobile phones, new and upgraded versions are available in the market as early as six months from the date of initial launch of a particular model. A significant portion of inventory of mobile phones becomes obsolete every year. The company generally resorts to a discounted sale to liquidate such obsolete models.

The management at Sun Electronics has identified e-commerce as an opportunity for faster growth, both in terms of revenues and profitability. The company is considering launch of its own e-commerce website to sell all products which are currently being sold in physical stores. Depending upon the success of online sales, the company might choose to optimize and close certain physical stores in the next couple of years.

The management of the company is cognizant of the fact that existing inventory procurement and management system will not fit in the new e-commerce business. E-commerce works on a

inventory light model and quick as well as on time delivery of products of the customers. The fact that customers could be from a location other than those where Sun Electronics has physical presence makes the matter complex.

Required :

The company is considering implementation of a supply chain management system. Will a supply chain management system be of use to Sun Electronics in light of the e-commerce venture? You are required to EXPLAIN the concept of Supply Chain Management and EVALUATE the applicability of it in the current case.

Solution 10 :

Issue

Sun electronics manufactures and sells various electronic products through its physical stores. The existing manufacturing system does not take into consideration the demand of products in the market. Store managers are allowed to submit only one order per month. A high level of inventory can be seen at Sun Electronics as compared to the industry average. The store managers tend to keep high level of inventories as a safeguard against stock-outs. Whereas, keeping inventory to meet customer requirement is good, high level of inventories due to inefficient processes is not advisable.

The company also has a longer working cycle because of a long order to deliver time and excess holding of inventory. A significant amount of working capital is blocked due to this practice. Technology changes rapidly and the company is expected to roll out latest products in the market. A product like mobile gets outdated very soon and the company has to resort to discounted sales. This results in financial losses to the company.

The company has identified an opportunity in e-commerce. E-commerce businesses require leaner models and faster response time. The production must be based on the demand from the customer and not on an ad-hoc basis. In the following paragraphs, the importance of supply chain management (SCM) and its applicability in the current case is discussed.

Supply Chain Management (SCM)

Supply Chain Management can be defined as the management of flow of products, services and information, which begins from the origin of products and ends at the product's consumption at consumer's end. SCM also involves movement and storage of raw material, work-in-progress and finished goods. In other words, supply chain management involves management of all activities associated with moving goods from the raw materials stage to the end user. An important objective of SCM is to correlate the production and distribution of goods and services with demand of the product.

The following are the various activities which an organisation carries out to meet the customer requirements (Primary activities under value chain model) -

- Inbound Logistics covering procurement and related activities.
- Operations covering conversion of raw materials into finished products
- Outbound Logistics covering movement of products from plants to end users
- Marketing and Sales
- Service

Supply Chain Management looks each of the above activities as integrated and interrelated to each other. None of the activities can be looked in isolation. In the case of Sun Electronics, there is a restriction on number of orders which a store manager can place. This would lead to excess ordering because of the fear of stock-outs.

The customer demand is completely ignored and hence the production is not in sync with the market demand. This could lead to excess production, higher inventory holding and longer working capital cycles.

The facts presented in the case indicate the following problems at Sun Electronics:

- Production planning is not based on customer demand & is done on an ad-hoc basis.
- Inventory holding period is very high (45 days against an industry average of 15 days).
- The working capital cycle is longer.
- The time take to fulfill an order from the store is very high.
- The production is dispatched to a central warehouse for further deliveries to the stores. This could be an inefficient process.
- Sale of outdated products at discount for products with low shelf life.

SCM Process and applicability to Sun Electronics :

The SCM process is explained below:

- Plan - The first step in SCM process is to develop a plan to address the requirements of the customer. Sun Electronics must shift its focus from ad hoc and predetermined production planning to understanding the requirements of customers. Production must be planned based on the demand of products. The focus must be on producing what the customer wants.
- Develop (procure) - In this step, the materials required for production is sourced from various suppliers. A good relationship with supplier is required to ensure that the parts/materials are received as and when required by the production team. It is also important that the vendors supply quality material which is not the case in Sun Electronics. The company must select suppliers which are dependable and can deliver quality products in the stipulated time. The company must focus in reducing the lead time required for sourcing materials which will reduce the inventory holding period.
- Make - The third step is making or manufacturing the products required by the customer. This is quite different from the existing practice in Sun Electronics where store mangers are allowed to place only one order. This would mean that the company is not considering the ever changing demands and tastes of the customers.
- Deliver - The fourth stage is to deliver the products manufactured for the customers. This stage is concerned with logistics. The time required to deliver to the store in case of Sun Electronics is very high. The company must evaluate if the centralised warehouse is causing delay in delivery of products to the stores.

Logistics is one of the important components of the entire supply chain process. Right from procurement of material, movement of raw material in the plants and final delivery of products to customers, logistics play a critical role. An excellent system must be in place to ensure that the movement of materials and final product are uninterrupted.

Warehousing also plays an important role in today's business environment. The company has a centralised warehouse to meet the needs of all its stores. This would not be the most efficient way. The company must evaluate creation of additional storage facility which would ensure timely delivery of goods to the stores. Newer products can reach the market faster.

The company can also think of dispatching the finished products directly from the factory to the stores. It can have a finished goods warehouse in the factory premises itself and a dispatch office which can process the orders of its stores. This will save the transportation cost from factory to centralised store as well as the time required for delivery.

Benefits of SCM to Sun Electronics

SCM looks at the entire value chain process as an integrated process. There is a seamless flow of information and products between suppliers and customers. The customer's requirements would be captured to plan the production. The suppliers would be intimated to supply the materials according to the production plan. An effective logistics system ensures that movement of materials is seamless. Sun Electronics can also consider implementing an integrated ERP which would also interact with vendors on real time basis.

The following benefits of SCM can be envisaged for Sun Electronics -

- Better Customer Service as customer is supplied with what he/she wants in the minimum time.
- Better delivery mechanism for goods.
- Improves productivity across various functions and departments.
- Minimises cost (both direct and indirect).
- Reduces the inventory holding time and improves the working capital cycle.
- Enhances inventory management and assists in implementation of JIT systems.
- Assists companies in minimising wastes and reduce costs.
- Improves supplier relationship.

E-Commerce and SCM

The SCM is the backbone of E-commerce industry. Customers buying products online want deliveries to be faster. Another distinct feature of e-commerce is that buyers could be located in any corner of the country and not just restricted to the cities where Sun Limited has physical presence. This definitely means that the company must have an effective Supply Chain Management in place which could meet the customer's requirement.

The existing practice of one order per month from each store would not work in the e-commerce space. Orders can come at anytime and from anywhere. Supply Chain Management would be required for success of e-commerce business.

Customer Orders

The company must have an effective mechanism to capture customer orders and feed it into the production planning on a real time basis. An integrated ERP system would be required for this purpose. Any delay in intimating the production team would mean delay in production and delivery which would not be taken positively by the customers. The existing system of one order per month from a store would not fit the purpose. A real time flow of information would mean lower inventory holding.

Procurement

The material requirements must be communicated to suppliers seamlessly. The company must identify those vendors who can delivery quality materials in the required time frame. A delay in supplies would delay the production process. A company cannot afford this in e-commerce business. Automatic exchange of information using EDI (Electronic Data Interchange) or Integrated ERP systems would ensure that the vendors receive material requirements in a timely manner.

Production

As discussed earlier, the production must be in accordance with the customer order. This requires a shift in approach of the production team. Business environments have shifted from "Customer will buy what we produce" to "We have to produce what the customers require". The company would ideally not produce products to store them and sell later.

Logistics

Logistics would be the backbone of entire e-commerce set up. Right from sourcing of materials to delivery of products at the customer's door step, logistics would play an important role. If the company has an in-house logistics facility, the logistics team must be trained with the requirement of the new business. If the company has outsourced the logistics, vendors must be briefed about the requirements of the e-commerce. The company might have to tie up with new logistic vendors to avoid any delay in deliveries.

Question 11 : [ICAI website]

Memorable Travels is a tour operator offering holiday packages to a variety of customers. They advertise and promote their packages using print advertising in newspapers and colorful brochures. A basic holiday package would include transport from the city to the destination, stay, food, attractions, or activities. Memorable Travels has been in business for the past 15 years. It has standard agreements with its suppliers based on which it has been offering standard holiday packages to its customers. Profitable business over these years has resulted in surplus cash that the company intends to reinvest in its business. Recently, the management has noticed increase in the number of complaints regarding these packages. This has resulted in lesser number of customers opting for these tours.

A study of these complaints has indicated that customer expectations from a holiday trip vary depending on their age group. Accordingly, Memorable Travels wants to offer customized holiday package trips that would suit the travellers' expectations. It wants to increase the number of packages offered to customers in addition to adding variety to them. This would provide customers the choices from which they can customize their holidays with the help of Memorable Travels.

The management wants to understand the need and importance of supplier chain management in a service organization such as itself.

Required :

(i) DEFINE the objective of Memorable Travels should have when considers incorporating the supply chain management framework into its business model.

(ii) IDENTIFY possible components of Memorable Travels' upstream supply chain.

(iii) SUGGEST the key processes in the business model of Memorable Travels.

Solution 11 :

(i) Memorable Travels is providing a service wherein it uses its assets, staff, and resources to provide customized travel packages to its customers. It should consider how to utilize its assets and staff to design and manage its supply chain such that it meets the customers' demand in a cost-effective manner. Customers' demand is uncertain due to (a) customization of holiday packages to suit their individual expectations and (b) sensitivity of travel to factors like economic prosperity, law, and order etc.

Business processes must be effectively coordinated across organizations and functions to meet the customers' expectation in the best possible manner. The ability of Memorable Travels to respond to its customers' demand defines its operational capacity. Having more capacity (capability) to meet customers' demand helps it be more responsive and flexible. However, this has to be balanced with its ability to maintain an effective supply chain management. A supply chain is effective only when Memorable Travels and consequently the ultimate customer, is able to get the required level of service from its suppliers.

(ii) As mentioned in the problem, a basic holiday package would include transport from the city to the destination, stay, food, attractions, or activities. Accordingly, possible components of Memorable Travels upstream supply chain would include partnerships with :

(i) Transport providers – road, rail, and air travel providers. This includes travel to the holiday destination as well as the local transport within that location.
(ii) Lodging and accommodation providers – hotels, bed, and breakfast providers etc.
(iii) Local food producers and restaurants.
(iv) Providers of tourist attractions and activities.

(iii) Key processes in the business model of Memorable Travels would be:

Information Flow

- ➔ Information flow is critical at various stages:
- ➔ to understand expectations of customers
- ➔ to share this information with the suppliers of service with whom Memorable Travels has partnership
- ➔ to establish clear service level agreements with these suppliers and to clearly define the scope of work
- ➔ to be able to monitor the performance of these suppliers. Performance has to be monitored because it will impact payment settlements with these suppliers
- ➔ to collect constructive feedback from customers about the performance of these suppliers

Capacity and Skills Management

Memorable Travels has to develop the ability to cater to various expectations of its customers. It has to develop assets and skilled staff who can attract customers and help them customize their holiday packages. To enable this, the company has to invest in its organization, processes, assets and staff. As mentioned above in point (a), information flow is a key process in this business model. The company has to invest in its processes to ensure that information flow is smooth and accurate. Similarly, it has to invest in assets like IT infrastructure, offices and also develop a skilled staff who can provide quality service. Memorable Travels should also have the ability to develop pool of suppliers who provide good quality service. Better capacity to cater to customers' demand better will ensure that Memorable Travel can develop and maintain its business efficiently. However, since building capacity and developing skills comes with a cost, that has to be balanced out with the revenue it generates.

Demand Management

Memorable Travels will have to focus on how to generate demand for its products. In tune with changing times, Memorable Travels will have to change its marketing from print based advertising to online advertising in order to have a larger outreach to attract customers. The company should be able to manage variation in customers' expectations in a cost- effective way. As explained in point (b) above, this will be determined by the capacity of its operations and skills of its employees. Higher the capacity more the flexibility in its operations.

Customer Relationship Management

Customer segmentation and monitoring help in understanding customer's needs in a better way and to focus on efforts to meet those needs through proper and timely communication of information with its service suppliers. However, the cost of maintaining this framework should not exceed the revenue that each customer segment generates. Accordingly, customer account profitability analysis should be prepared for each customer segment.

Supplier Relationship Management

As part of the customer relationship management, specific needs of customers would be identified. Based on these needs, potential suppliers who provide services of the requisite quality need to be identified. Service level agreements need to be drawn up after comprehensive rounds of negotiations. It is imperative to have a clear understanding with these suppliers regarding the quality service expected.

Service Delivery Management

Agreements with suppliers will help to ensure that expectations of customers of Memorable Travels are being met. Service performance must be monitored, checked continuously for compliance. Any deviation from scope may have an impact on the payment settlement to be made with the supplier.

Cash Flow

As mentioned above, service delivery should be monitored to ensure that payment is made only to the extent the agreed quality of service is delivered. Periodic payments to suppliers should be made based on service level agreements. Similarly, cash inflow from customers should be monitored to avoid any bad debts. Pricing for packages should be based on the level of service offered. Again, clear understanding of the terms of contract is essential to avoid uncertainties.

All processes within the company are linked to each other. Understanding the customers' expectations have a direct impact on the supply chain. Therefore, proper co-ordination is required for smooth functioning of the organization and its supply chain.

Question 12 : [RTP Nov. 2020 + Case Study Digest of ICAI]

An apparel manufacturing company has a factory in Ahmedabad, making denim clothing for customers of all ages. It sells its clothing from its factory outlet store located within the city. Until 6 months back, the company had a business model wherein the products manufactured as its factory would be sent to its factory outlet store. Customers would visit the store and choose apparel suiting their tastes. Production was based on prediction of customer demand. This "made to stock" model has been placed for many years.

Few months back, the store manager noticed many customers exiting without making any purchases. Tracking this and after obtaining feedback from customers over sometime, it was found that many products were unacceptable to the customers' tastes – either the shade or design of denim was not what they wanted or that the apparel was not of the correct fit for them. The management then decided to provide customers a choice of either choosing from their standard apparel range that has already been made ("made to stock" model) or to offer them a "made to order" option.

The company now displays its range of denim material at the factory outlet. Customers can go through the samples and choose the material of their choice. Company certified tailors would then take measurements based on the customers' preferences. A detailed order customized to the customers' needs would then be drawn up. The factory has set up a separate tailoring division that would stitch the apparel specifically for these "made to order" sales. For this new machines and production line resources have been put in place.

Customized products are manufactured and made available to the customer within 3 working days' time from the date of placing the order. The customer comes to the store and picks up the apparel ordered. For delays beyond this timeline, the customer gets to pay 5% less on the order value. This is done to attract and maintain customers, who would otherwise choose to purchase apparel offered by rival competitors. Therefore, speed of delivery of the customized product is

critical for the company. This is the main selling point for the company to operate the "made to order" business model.

If further modifications are needed due to errors on part of the company (quality / finishing issues), the apparel would need to be modified / re-stitched once again. The company will bear the cost of modification or replacement of garment.

This new "made-to-order" has been in place for the past 6 months. At the stage of project proposal, the management found it a lucrative option for the company because:

(i) Customers are willing to pay a higher price to have customized clothing as compared to the standard fitting.

(ii) It would attract more customers to the store.

(iii) If the model works well, the dependence on the "made to stock" model can reduce. Savings in inventory cost, obsolescence and warehousing costs will benefit the company's bottom-line.

Customers have been very enthusiastic in availing this customization facility offered by the company. Sales have increased manifold in the last few months. Therefore, the management is interested to understand the metrics related to their "made to order" business mode to assess its success and risks. Some of the non-financial metrics are:

Metrics	Month					
	1	2	3	4	5	6
Orders needing modification on account of errors in order taking or manufacturing process (% of sales orders made under "made to order" model)	15%	12%	10%	8%	5%	4%
Orders delivered beyond the 3 working days timeline (% of sales orders made under "made to order" mode)	5%	4%	3%	6%	7%	5%
Production downtime (hours)	44	88	22	141	132	123
Labor idle time due to unavailability of material (hours)	25	22	17	13	24	22
Ratio of "made to order" to total sales from the factory outlet (Ratio of sales value)	16%	22%	25%	32%	34%	38%
Repeat orders by customers availing this facility (% of customers giving repeat order/ total customers availing "made to order" facility)	4%	21%	33%	54%	60%	63%

Required :

ANALYZE the non-financial measures of quality of the division over the six-month period. Focus on the production performance, delivery cycle performance and customer satisfaction.

Answer 12 :

Workings :

Metric	Month						Monthly Average
	1	2	3	4	5	6	
Production Performance :							
Orders needing modification on account of errors in order taking or manufacturing process (% of sales orders made under "made to order" model)	15%	12%	10%	8%	5%	4%	9%
Production downtime (hours)	44	88	22	141	132	123	91.67
Labor idle time due to unavailability of material (hours)	25	22	17	13	24	22	20.50
Delivery cycle time :							
Orders delivered beyond the 3 working days timeline (% of sales orders made under "made to order" model)	5%	4%	3%	6%	7%	5%	5%
Customer satisfaction :							
Repeat orders by customers availing this facility (% of customers giving repeat order/total customers availing "made to order" facility)	4%	21%	33%	54%	60%	63%	39.17%
Ratio of "made to order" to total sales from the factory outlet (Ratio of sales value)	16%	22%	25%	32%	34%	38%	28%

Analysis of the operating data of the "made to order" at the business store revealed the following:

Production Performance:

(i) Modifications to orders: Company has to bear the cost of modifications / replacement of the garment incurred on account of error in its order taking or manufacturing process. Therefore, orders needing such modification should be kept at the minimum. Such instances were higher than 10% in the first three months. With experience, either in the order taking process or manufacturing process, these errors have reduced substantially in the later months. The managers of the order taking and manufacturing department need to understand and constantly keep track of these errors in order to keep them at the bare minimum. Management may want to set a benchmark, financially in terms of the cost of modification and non-financially in terms of the acceptable threshold for such instances. Monthly tracking of this metric will help detection of errors earlier.

(ii) Production downtime: Production downtime normally occurs either due to break down of machinery or plant maintenance. It is unproductive time, reducing the machine's capacity. It must be kept minimum. Downtime hours have been steadily increasing in the last 3 months, the overall monthly average being 91.67 hours. The production manager has to analyze and take corrective action at the earliest. Urgency of the issue can be compounded by the fact that sales orders under the "make to order" model have been increasing steadily over the last few months. In the latest month, 38% of the overall sales was from this model. Therefore, the production capacity should be utilized optimally to ensure ability to meet delivery deadlines.

(iii) Labour idle time: Labour idle time due to unavailability of material is another unproductive waste of resource. The procurement department can address unavailability of material. On an average 20.5 hours of labor time is idle due to unavailability of the appropriate material. Appropriate steps with suppliers can lead to agreements to ensure seamless supply of material when required. This will enable the company to meet delivery deadlines given to customers.

Delivery Cycle Performance:

(i) On-time delivery: The orders need to be delivered to the store within 3 working days of placing order. The customer picks up the order from the store. Speed of delivery is critical to the company. For any delay beyond this timeline, the customer benefits by a 5% reduced price on the order as compensation for delay. Prompt delivery is also the company's selling point to attract customers, who would otherwise patronize its rivals. On an average 5% of the orders are not delivered within time. Therefore, average delivery success rate is only 95%. The management has to take steps that this is kept to the minimum in order to reduce loss of revenue and also to build brand loyalty with the customer base.

Customer Satisfaction:

(i) Repeat orders by customers: Prompt and quality delivery of the customized order would ensure that customers return in future with further orders. Statistics shows that repeat orders have steadily increased, which is a very positive signal to the management. Initially, only 4% of the customer under this model placed repeat orders. This increased substantially. Now almost 63% of the customers who purchase under this model come back with more orders.

(ii) Sales mix: Popularity among customers for customized services is further validated by the steady increase in the ratio of such sales to the overall sales of the company from the factory outlet. Now, this model generates an average of 28% of the total sales from the outlet, with a likely projection of having a higher share in the overall sales mix. Therefore, the "make to order" model can be termed as success.

Question 13 : [Jan. 2021 Exam - 20 Marks]

RS Tools Ltd. is a leading force in manufacture and supply of modern agriculture equipment like Power Tillers, Kisan Krafts, Agriculture Reaper and other Lawn Care equipment. The company grew substantially over the course of decades and presently ranked 20th by size in the global arena and has become a household name in every agriculture family in the country.

As commonly happens when an enterprise grows in leaps and bounds in a way like this, RS Tools Ltd. is experiencing an increasing degree of supply chain complexities and for many years it did nothing to address the difficulties of its decentralized and fragmented network. The top management decided recently to enter into small irrigation component segment with the brand name 'SIRI', the demand for which is extremely seasonal, and majority of sales are forecasted to occur between April to July every year. The company currently is replenishing dealer's inventory every month, using direct shipment from its central warehouse which is not order driven and is not in sync with the industry average. This kind of dispatching the orders is proving too costly and too slow and not in consonance with the demand pattern. The top management of RS Tools Ltd has started getting doubts about the company's ability to supply its existing 300 plus dealer network, to meet the consistent market demand of its regular agriculture equipment along with the seasonal demand of its new branded products 'SIRI'. They recognized that this state of affairs cannot be to allowed to continue in the long run and decided to adopt a long-term program of strategic optimization.

The company has launched an initiative to achieve a target of 15% reduction in supply chain cost within next 3 years and constituted an expert group to oversee this task. Mr. Karthik, the

management consultant, is unanimously appointed at the board meeting to head the expert group formed to revamp the supply chain management. The management is squarely convinced with three of his bold and frank remarks to the board that :

(a) "Most Companies begin with the best intentions to achieve successful and sustainable supply chain cost management, but somehow lost momentum, only to see costs increase in short term due to the implementation costs of SCM"

(b) "If you tell me your company hasn't been able to sustain any progress in supply chain cost reduction in short run, I wouldn't be surprised at all".

(c) "No producer has the ability to give the customers what they want, when they want and at the price they want unless the value chains also have been encouraged".

When the expert team headed by Mr. Karthik began investigation, they found three areas of feasible leverage to reduce supply chain costs which are listed below –

(i) Consolidating shipments and use of third-party logistics providers as the existing decentralized environment of sourcing and inbound logistic are being managed by teams in different places with insufficient transparency in supply chain.

(ii) Leveraging on maintaining optimum inventory by bringing the order cycle time down to an industry average of 15 days.

(iii) The existing supply chain has evolved rather than grown by design and hence had become unnecessarily complex and the enterprise as a whole is not taking the advantage of synergies and economies of scale.

Mr. Karthik undertook a supply chain network redesigning program –

- To reorganize the supply chain,
- To reduce cost to serve and
- To lay the groundwork for future capability in the supply chain.

He is determined to revitalize the Supplier Relationship management as well as the number of suppliers are very large in number and the company is burdened with quality, delivery and payment issues from the suppliers. He has decided to suggest the use of E-procurement process as a part of upstream supply chain as a remedy to this hiccup.

You being an associate consultant in his office have been asked by Mr. Karthik, to help him by preparing a briefing to be given to the board based on the above facts with particular references in the following :

(a) LIST the critical issues being faced by RS Tools Ltd under the present setup based on the facts of the above case. **(3 Marks)**

(b) In the light of the initial remarks made by Mr. Karthik at the time of he being designated to head the expert group, EXPLAIN the supply chain management and ANALYZE the validity of the views expressed by Mr. Karthik. **(4 Marks)**

(c) LIST the major benefits that RS Tools Ltd would reap by energizing the Supply Chain Management. **(3 Marks)**

(d) EVALUATE how Supplier Relationship Management is going to help RS Tools Ltd. **(4 Marks)**

(e) DESCRIBE E procurement and its process in the context of upstream supply chain management and DISCUSS its constituents. **(3 Marks)**

(f) ADVISE whether the outsourcing as suggested by Mr. Karthik would help RS Tools Ltd in setting logistic constraints. **(3 Marks)**

Answer 13 :

(a) Due to **decentralized and fragmented network** the supply chain in present set-up is complex and caused **following critical issues** being faced by RS Tools Ltd.

1. **Costly and slow supply** – Because currently RS Tools Limited is supplying from central warehouse.
2. **Supply not in consonance with the demand pattern** – Currently RS Tools Limited replenishing dealer's inventory every month, which is not order driven and is not in sync with the industry average.
3. **Wide dealership and required infrastructure** – Since the dealers are large in quantum and fragmented too hence there is doubt about ability to supply its 300 plus dealers.
4. Regular agriculture product has **consistent market demand**, while new branded products SIRI has **seasonal demand.**

(b) Since **supply chain** encompasses all activities and information flows necessary for the transformation of goods from the origin of the raw material to when the product is finally consumed or delivered, hence **supply chain management is the continued management of the flow of goods and services and includes all processes that transform raw materials into final products;** It involves the active streamlining of a business's supply-side activities from sustainable perspective to maximize customer value and gain a competitive advantage in the marketplace.

The views expressed by Mr. Karthik are valid largely. Sustainable **supply chain cost management is continuous effort** rather than one-time initiative, wherein **commitment is required from top to bottom** of organisation to reap the desired results.

Complex the structure is, more and more time it would require, hence in short run cost may be more than benefits (in term of cost reduction). Since the Supply Chain Management has a purpose to maximise the customer value, hence yield better results when **supported by value chain analysis.**

ALTERNATIVE Answer for 1(b)

A complete chain serving the customers or consumers whether linked or interdependent is the composition of supply chain. It comprises vendors that supply raw material, producers who convert the material into products, warehouses that store, distribution centres that deliver to the retailers and retailers who sell the products to the ultimate user.

All activities associated with the flow and transformation of goods from raw material to end user is called supply chain. An important objective of SCM is to correlate the production and distribution of goods and services with the demand of the product.

Analysing the Views of Mr. Karthik

(i) Implementation of supply chain management should be viewed as an investment rather than cost that should be minimized. Implementation of SCM may demand relatively high investments in installing quality software and may also prompt certain hidden costs. Some expenses cannot be forecasted beforehand, and this may frustrate the top management if they are interested to reap in readymade results. So, this commitment is valid.

(ii) The term supply chain can be referred to as the entire network of organisation working together from design, produce, deliver, and service the products. In other

words, all activities associated with the flow and transformation of goods from raw material to end user is called supply chain. It is a multifaceted exercise and cannot present any instant and onetime results. So, the comment is valid.

(iii) The following activities which are termed as primary activities under the value chain model forms part of SCM.

- Inbound Logistics covering procurement and related activities.
- Operations covering conversion of raw material into finished products.
- Outbound Logistics covering movement of products from plants to end users.
- Marketing and Sales
- Service

Supply Chain Management looks each of the above activities as integrated and interrelated to each other. So, the comment that unless value chains are encouraged customers' demands cannot be met is also valid.

(c) Supply Chain Management leads to strategic optimisation through enormous benefits such as inventory reduction, personnel reduction, productivity improvement; order management improvement, financial cycle improvement etc. Further it results in information visibility, new / improved process, customer responsiveness, standardization, flexibility & globalization of business performance.

Energizing the Supply Chain Management expected to reap following benefits to RS Tools Limited –

1. **Optimum inventory in consonance with the demand pattern** – by cutting order cycle time from 1 month to an industry average of 15 days will bring down the inventory to optimum level and improve the working capital cycle.
2. **Expertise of third party logistic (TPL)** – No, doubt outsourcing cause cost, but it will bring the expertise too apart from saving of time & resources which management can spend upon the core and value generating activities.
3. **Ease and transparency** - Current supply chain is evolved rather designed, hence energizing the supply chain management can remove the existing complexities and bring the ease to RS Tools Ltd. Further transparency regarding process and customer requirement will also be there due to generation, transmission and management information as part of supply chain management.
4. **Reduced supply chain cost** – either due to reduction in inventory to optimal level or streamline the activates over supply chain from procurement (such as e-procurement) to delivery to customer (such as using TPL) will result in supply chain cost management. It is important here to note that RS Tools Limited aim for 15% cost reduction target in three years' time.
5. **Generating capabilities and becoming future ready (sustainable supply chain)** – Currently RS Tools Ltd. is doubting their capabilities to continue the supply of regular products to existing 300+ dealers. It is extending the product range as SIRI is added and in future expected to expand the dealers' network too, hence energizing the Supply Chain Management can help in term of improved and enhanced capabilities.

(d) A supply chain when the flow relates to supplier it is termed as upstream flow, hence management of transaction with the supplier will be termed as **upstream supply chain management**. Upstream supply chain management rely upon **supplier relationship management** and **use of information technology.**

Supplier relationship management provides the structure for how relationship with suppliers are developed and maintained. This helps the organisation to gain the advantage out of supplier capabilities to innovation, ensure quality, be reliable – in terms

of delivery and frequency, eliminate the variation in costs/price reductions and agility to reduce risk factors.

Revitalization of Supply relationship management expected to help RS Tools Limited in following manners –

1. **Extended value chain (& consolidated supply chain) to ensure quality and innovation** – Concern for quality is mentioned in case. Purpose of supply chain management is to improve the customer experience by offering more value. Value in product depends upon input used, hence supplier can play vital role in same. For this, relations with suppliers should be cordial, and Supplier relationship management is capable to ensure this.

2. **Reduce in number of suppliers for better management and favourable credit & trade terms considering the payment issue -** since it is mentioned in case that RS Tools Limited is burdened with the payment issue, hence may buy its supplies from limited suppliers. Because it is obvious if large volume purchase from limited suppliers or selected suppliers, they will offer relaxed credit terms at competitive prices. As against this if requirement is to avoid failure in delivery, then prefer multiple suppliers. Switching to new supplier may reduce the cost in some cases.

3. **Enhanced reliability in delivery -** Better relationship with supplier and sharing of information lead to enhanced reliability in delivery in term of quantity, frequency, place and time. However, an audit needs to be made of supplier performance and the opportunity, or otherwise, for RS to concentrate on suppliers ability to deliver on time. Clearly there are costs associated with this.

(e) A supply chain when the flow relates to supplier it is termed as upstream flow, hence management of transaction with the supplier will be termed as upstream supply chain management. The main activities of upstream supply chain are procurement and logistics. Upstream supply chain management rely upon supplier relationship management and use of information technology.

E-Procurement is the electronic methods beginning from identification of the organization's requirements and ends with payment to supplier. It can be seen as technology solution designed to centralise and automate interactions between an organisation and its' suppliers to improve the speed and efficiency of procurement practices.

E-Sourcing, E-Purchasing and E-Payment are constituent of E-Procurement.

E-Sourcing covers electronic methods for finding new suppliers and establishing contracts. E-Sourcing is inviting the tenders and quotations online from any part of the world, that too in cost and time effective manner; hence E-Sourcing is considered as the best possible way to find out the best supplier.

E-Purchasing covers product selection and ordering online, hence streamlines procurement and reduce overheads. Decentralised and need based orders are placed rather than by central ordering department.

E-Payment includes tools such as electronic invoicing and electronic funds transfers. This brings benefit of real-time settlement, error proof system and automatic and real-time record maintenance through ERP.

(f) Outsourcing is business practice used by companies to reduce costs (extra capital expenditure in technology) or improve efficiency by shifting task, operations jobs or processes to another party for a span of time. Outsourcing suggested by Mr. Karthik would help RS Limited in setting logistic constraints to large extent, because –

1. Currently it is feeling doubtful whether has **ability to serve the existing network of 300+ distributors,** while it is replenishing dealer's inventory every month. When it starts replenishing the inventory after every 15 days then existing logistic system may fail hence outsourcing may be a way out to settle the existing logistic constraint.

2. Newly acquired **product SIRI has seasonal demand** only for 4 calendar months in a year, hence generating logistic capabilities for 4 months which remain idle for remaining months of year does not seem financially viable solution hence outsourcing in case of SIRI is seemingly best way to settle the existing logistic constraint.

Note - Third party logistics provider's expertise may enhance customer experience and management may get more time to focus on strategic aspects. Hence RS Tools Ltd. need to evaluate its value chain and try to categorise logistic either as value generating or non-value generating activity. If logistic is largely non-value generating activity from the customers' perspective of RS Tools Limited, it shall be outsourced and focus on the core. Overall, depending upon the application of various strategic cost management techniques, decision on outsource shall be taken.

Student Note :

- Conceptually correct and brief explanation is sufficient for each step.
- Alternative points and reasoning are also possible.

Questions on Outsourcing

Question 14 :

TP Ltd. produces a product which passes through two process – cutting and finishing. Achieving targeted sales is becoming increasingly difficult. Hence, the company is introducing slightly modified features in the fresh production.

The following information is provided:

Particulars	Cutting	Finishing
Hours available per annum	50,000	60,000
Hours needed per unit of product	5	12
Fixed operating costs p.a. excluding direct material	10,00,000	10,00,000

The selling price of the product is ₹ 1,000 per unit and the only variable cost per unit is direct material, which costs ₹ 400 per unit. There is demand for all units produced.

Evaluate each of the following proposals independent of each other:

(i) An outside agency is willing to do the finishing operation of any number of units between 5,000 and 7,000 at ₹ 400 per unit.

(ii) An outside agency is willing to do the cutting operation of 2,000 units at ₹ 200 per unit.

(iii) Additional equipment for cutting can be bought for ₹ 10,00,000 to increase the cutting facility by 50,000 hours, with annual fixed costs increased by ₹ 2 lakhs.

Solution 14 :

Key Data:

Particulars	Cutting	Finishing
(a) Hours available p.a.	50,000	60,000
(b) Hours needed per unit	5	12
(c) Max. production capacity (in units) [a / b]	10,000	5,000
(d) Throughput contribution = 1,000 – 400 = ₹600		

(i) Throughput Contribution 600

(-) Subcontracting charges 400

Incremental contribution p.u. 200

As capacity of finishing process is limited to 5,000 units only, but we have the surplus capacity in cutting process, hence any production over 5,000 units will lead to an incremental contribution of ₹ 200 per unit. We should utilize the services of outside agency for finishing operation.

(ii) Already cutting has surplus capacity. It is not a bottleneck. Do not outsource as there will be no benefit, instead there will be reduction of throughput contribution by ₹ 200 p.u. if outsourced.

(iii) Cutting has surplus capacity. Do not increase non-bottleneck capacity. Instead increase the capacity of Finishing Machine.

Question 15 :

P Ltd., manufactures plastic cans of a standard size. The variable cost per can is Rs. 4 and the selling price is Rs. 10 each. The factory of the company has eight machines of identical size. Any individual machine can produce 30 cans per hour. The factory works on a 300 days per annum basis and the actual available hours per machine per day is 7.5. The company has an order of 4,20,000 cans from an oil company, to supply. The yearly fixed cost of the company is Rs. 20 lacs.

P Ltd. has received an order from another firm for supplying 60,000 nos. of plastic moulded toys. The price of the toys is Rs. 60 each and the variable cost is Rs. 50 each. While this order would be acceptable for supplying for total quantities only, on acceptance, a special mould costing Rs. 2,25,000 would be required to be acquired to manufacture the toys. The time study exercise has revealed that 15 nos. of toys can be produced per hour by any of the machines.

Advise the company, with reasons in the following situations :

(i) Whether to accept the order of manufacturing moulded toys, in addition to supplying 4,20,000 nos. of cans or not;

(ii) Whether to accept the order of manufacturing moulded toys, if the order of cans increases to 5,40,000 nos. or not;

(iii) While a sub-contractor is willing to supply the toys, either whole or part of the required quantities at an all inclusive rate of Rs. 57.50 each, what would be the minimum excess capacity needed to justify the manufacturing of any portion of the toys order, instead of sub-contracting ?

(iv) The company had an understanding that the orders of the cans will be increased during the year on negotiation, and planned and manufactured 4,50,000 cans during the year. For

utilizing the excess capacity, they also accepted the toys order and sub-contracted only 15,000 nos. of toys. At the year's end however, it was revealed that the order of the cans could be for 4,80,000 nos. if it was properly negotiated. How much loss has been suffered by the company due to improper prediction of demand and negotiation?

Solution 15 :

P Ltd.

1. Key Data :

Contribution per unit of can	= 10 – 4 = Rs. 6
Contribution per unit of toy	= 60 – 50 = Rs.10/- unit
Output / hour of cans	= 30 unit/ machine hr.
Output / hour of toys	= 15 unit/ machine hr.
Total available machine hrs.	= 7.5 hrs. per day x 300 days x 8 machines
	= 18,000 hrs.
Incremental cost of mould for toy	= Rs. 2,25,000/-

2. Evaluation of the 1st option : Accepts the order of manufacturing moulded toys

Total machine hours required for manufacturing of 4,20,000 cans = 4,20,000 / 30 unit/hr.
= 14,000 hrs.

Therefore balance hours left = (18,000 – 14,000) hrs = 4,000 hrs.

Therefore no. of toys to be manufactured in 4,000 hrs. = 4,000 hrs x 15 units
= 60,000 units.

Therefore incremental profit from manufacture of 60,000 toys

= Incremental Contribution – Incremental Fixed Cost

= [(60,000 units x Rs.10) - Rs. 2,25,000]

= Rs. 3,75,000/-

Conclusion :

Considering incremental profit we should accept the order manufacturing moulded toys.

3. Evaluation of the second option : If order of manufacture of cans increases to 5,40,000

No. of hours required for 5,40,000 = 5,40,000 / 30
= 18,000 machine hrs.

In such case, we will not be able to manufacture moulded toys due to time constraints.

Incremental profit due to increase in order of cans

= Incremental contribution (-) Opportunity loss of toys

= [(5,40,000 – 4,20,000 units) x Rs.6 p.u.] – Rs. 3,75,000

= Rs. 3,45,000

Conclusion :

Considering incremental profit from production and sale of extra cans, it is not advisable to accept the order of molded toys but use the entire capacity for 5,40,000 cans.

4. Evaluation of the 3rd option : Manufacturing or sub-contracting the order of toys.

Calculation of cost indifference point

Let us assume no. of toys = X at which cost of manufacturing & sub- contracting is same.

Manufacturing cost = Subcontracting cost

50X + Rs. 2,25,000 = 57.50X

7.5X = Rs. 2,25,000; Hence, X = 30,000 toys.

Extra capacity (Machine hours) required = 30,000 toys / 15 unit/hr = 2,000 machine hrs.

Conclusion :

It means if surplus capacity left after manufacturing cans is more than 2,000 machine hours, then it is advisable to manufacture the toys instead of sub contracting.

5. Calculation of the impact on company's profit due to improper prediction and negotiations –

(a) Actual profit with 4,50,000 cans produced –

No. of machine hrs. used	= 4,50,000 / 30 units/hr	= 15,000 hrs.
Balance capacity	= 18,000 hrs. – 15,000 hrs.	= 3,000 hrs.
No. of toys to be manufactured	= 3,000 hrs. x 15 unit/hr	= 45,000 toys
Balance toys to be obtained on sub contract		= 15,000 toys
Total toys to be sold (45,000 + 15,000)		= 60,000 toys

Total profit earned –

Contribution from cans manufactured (4,50,000 cans x Rs. 6)	= Rs. 27,00,000
Contribution from 45,000 toys manufactured (45,000 toys x Rs.10)	= Rs. 4,50,000
Contribution from 15,000 toys sub contract [15,000 toys x (60 – 57.50)]	= Rs 37,500
Total contribution	= Rs. 31,87,500
Less : Total fixed cost (20,00,000 + 2,25,000)	= Rs. 22,25,000
Total Profit	= Rs. 9,62,500

(b) Expected profit with 4,80,000 cans produced –

No. of machine hrs. used	= 4,80,000 / 30 units/hr	= 16,000 hrs.
Balance capacity	= 18,000hrs. – 16,000 hrs.	= 2,000 hrs

At 2,000 hrs. manufacturing or subcontracting of toys makes no difference (refer W.N. 4)

Let us assume all 60,000 toys are subcontracted.

In such a case profit would have been –

Contribution from cans manufactured	= (4,80,000 cans x Rs.6)	= Rs. 28,80,000
Contribution from 60,000 toys sub-contract (60,000 toys x Rs. 2.50)		= Rs. 1,50,000
Total expected contribution		= Rs. 30,30,000
Less : Total Fixed cost		= Rs. 20,00,000
Total Expected Profit		= Rs. 10,30,000
Less : Actual profit as per W.N. 5 (a)		= Rs. 9,62,500
Hence, loss suffered due to improper prediction		= Rs. 67,500

* * * * *

3 LEAN SYSTEM AND INNOVATION

KAIZEN COSTING

Question 1 : Case Scenario [ICAI Module]

Maruti India Ltd. (MIL) is an automobile manufacturer in India and a subsidiary of Japanese automobile and motorcycle manufacturer Suzuki. It manufactures and sells a complete range of cars from the entry level to the hatchback to sedans and has a present market share of 22% of the Indian passenger car markets.

MIL uses a system of standard costing to set its budgets. Budgets are set semi-annually by the Finance department after the approval of the Board of Directors at MIL. The Finance department prepares variance reports each month for review in the Board of Directors meeting, where actual performance is compared with the budgeted figures.

Mr. Suzuki, group CEO of the company is of the opinion that Kaizen costing method should be implemented as a system of planning and control in the MIL.

Required :

RECOMMEND key changes which are vital to MIL's planning and control system to support the adoption of 'Kaizen Costing Concepts'.

Solution 1 :

Kaizen Costing emphasizes on small but continuous improvement. Targets once set at the beginning of the year are updated continuously to reflect the improvement that has already been achieved and that are yet to be achieved.

The suggestive changes which are required to be adopted for successful implementation of Kaizen Costing concepts in MIL are as follows:

1. Standard Cost Control System to Cost Reduction System: Traditionally Standard Costing system assumes stability in the current manufacturing process and standards are set keeping the normal manufacturing process into account. Thus the whole focus is on to meeting the performance standards.

   On the other hand Kaizen Costing believes in continuous improvements in manufacturing processes and hence, the goal is to achieve cost reduction target. The first change required is the standard setting methodology i.e. from earlier Cost Control System to Cost Reduction System.

2. Reduction in the periodicity of setting Standards and Variance Analysis: Under the existing planning and control system followed by the MIL, standards are set semi-annually and based on these standards monthly variance reports are generated for analysis. But under Kaizen Costing System, cost reduction targets are set for small periods say for a week or a month. So the period covered under a standard should be reduced from semi-annually to monthly and the current practice of generating variance reports may be continued or may be reduced to a week.

3. Participation of Executives or Workers in standard setting: Under the Kaizen Costing system participation of workers or executives who are actually involved in the manufacturing process is highly appreciated while setting standards. So the current system of setting budgets and

standards by the Finance department with the consent of Board of Directors required to be changed.

5S

Question 2 : Case Scenario [RTP - May 2018]

Y & E Chartered Accountants offers a wide range of specialized, multi-disciplinary professional services that meet the immediate as well as the long-term business needs of clients. One of the partner 'E' was upset with office documentation. 'E' argued that a document management solution is needed to maximize efficiency within the firm. The senior partner 'Y' has recently attended a seminar on lean system and heard about '5S'. He said that the old files hide the key files from the eye and forces staff to ask which to use. Accordingly, he desires to implement '5S'.

Required :

ADVISE on implementation of '5S' in Y & E.

Solution 2 :

Office processes often have huge amounts of paperwork and this not only makes processes slower but also allows errors to be introduced. 5S is a method of both cleaning out the working area and maintaining the cleanliness to improve process quality. The 5S process is based on:

Sort (Seiri)

This is sorting and removal of unnecessary files, papers, books and documents in the work area. Sorting is designed to make the work area neat, organized and arranged so that relevant items can be found easily. If an item is not relevant for the work, then it should not be in the work area.

Set in Order (Seiton)

Set in order means systematic arrangement of things i.e. arrange all necessary items into most efficient and accessible arrangement so that they can be easily be identified for use. It is advisable to have proper indexing of files and proper documentation i.e. proper index should be made and pasted on each file about its contents and in that pattern of contents, documents should be kept inside the files so that specific document can easily be traced and withdrawn on time. Even inside cupboard, paper of indexing about files with its name should be pasted so that specific file can easily be traced. Same can be done w.r.t. folders in computer, right file should be saved in right folder with identifiable name so that anyone can easily find any file. Frequent use items should be close by and infrequent use items can be further away in a central area. All storage areas should be clearly labeled to allow items to be put in the correct place, e.g. where did I leave the office stamp again?

Shine (Seiso)

After sorting and simplifying, it is necessary to keep the work area clean and safe. Shining is also an inspection process for the area, i.e. is everything in good condition. It is desirable to involve employees for 15-20 minutes each day to clean the work area so that they can have the habit of cleanness. In the same way, unimportant files either in desktop or any driver should be permanently deleted.

Standardize (Seiketsu)

A clean and tidy work area allows the process to be standardized and examined for quality or process improvements. Best practices are documented and rolled out across the work area, standards and process measures are established and displayed in the work area.

For example, red file can be standardized for very important files (can be required anytime), green file for important files and yellow file for unimportant files.

Sustain (Shitsuke)

It means to maintain discipline; this can only be achieved by auditing work areas and processes to make sure that the 5S standards are maintained. It is worthwhile to apply 5S standards continuously i.e. on daily basis and check for any upgradation if needed, so that firm can have good management in terms of documentation, cleanness, time saving of partners as well as clients.

Overall, 5S in offices streamlines the work flow, to reduce errors as well as improving process time and employee satisfaction.

Question 3 : [RTP May 2020 - Case Study]

Gold-Star Limited deals in manufacturing of traditional cycles. Recently apart from manufacturing old style cycles, GSL starts assembly of electronic cycles.

Since GSL didn't expand the factory area, post starting assembly of electronic cycles; hence production floor largely remains over-occupied with all sort of material, jigs, and tools; some of them are frequently useful, some are often and other are less often; even some are quite rare.

Workers usually complaint that all categories of jigs and tools are not available, tools which are available also of those belongs to those product design which are outdated (majority of such product are not further manufactured by GSL) accessible. Although floor manager is of opinion instead saying tools are not available, it can be said they are not accessible; because workers pick the tool from tool kit or tool board; but not place it back after use; hence it become difficult to locate such tool later or identify worker; with whom these may available.

On name of maintenance department, there are only two staff members, who are responsible for ensuring that every machine or equipment must be in running order and effective. Due to shortage of staff in maintenance department, requests for repairs of plant or machines are not handled within reasonable time frame and same will result in sharp deterioration of utility/ effectiveness of such plant or machine. Even in some of circumstances, replacements become/ remain only alternative.

GSL has reasonable standardize operating procedure for manufacturing of cycles business, but scenario is worse in case of assembly of electronic cycles. Since GSL is recently entered into assembly of electronic cycles, hence KPIs are not established for all factors which are part of assembly process including critical success factors.

At GSL, the attrition rate at senior management positions is quite high and no formal hierarchy tree is established, which result in drastic shifts in workplace culture (due to frequently changing role & responsibility).

Regarding safety of man and material, GSL is on front foot, taking all reasonable care; which is essential for purpose of eliminating any possibility of workplace accident. But assembly line of electronic cycles witness an incident recently, where one of model "x- 2" during assembly caught fire because wires set of "x-2" come into exposure of sparking from the light point near to such assembly line. Such fire causes burn of some of other material too, which are lying near to such assembly line.

Post such incident, CEO call for meeting with all the top tier executives, majorly including production and operation manager, safety staff, maintenance staff and store manager apart from management accountant. During the meeting while production and operation manager highlights some of problem areas, management accountant quoted 5S as solutions to problems faced by GSL.

CEO asked Management Accountant to be ready with report and presentation on 5S, which can highlight the operational aspect of 5S.

Required :

You are deputy to management accountant and asked by him to prepare a case, in form of report; in favour of implementing/ APPLYING 5S at GSL and EXPLAINING the expected benefit from implementation of 5S.

Answer 3 :

Report

Addressed to;
Office of CEO,
Gold Star Limited (GSL).
Dated – 07th Jan 2020

Report on operational aspect of 5S and expected advantage

5S represent scientific way of workplace management so that work can be performed effectively, efficiently, and safely. 5S was come into practice as part of Toyota Production System in early of mid- 20th century. 5S is usually considered as essential component of lean manufacturing, and foundation of eight pillars of TPM. The 5S refer to five Japanese words- seiri (sort), seiton (set in order), seiso (shine), seiketsu (standardize), and shitsuke (sustain). They define a system for workplace organization and standardization. Sort means to separate needed and unneeded materials and to remove latter. Set in Order means to arrange materials and equipment so that they are easy to find and use. Shine means to conduct a clean-up campaign. Standardize means to formalize procedures and practices to ensure that all steps are performed correctly.

Finally, sustain means to form habit of always following first four Ss through training, communication etc.

Note - Later 6th 'S' was also introduced and i.e. Safety.

S1 - Sorting

In order to overcome the problem of 'idle laying over material' all across production floor area, sorting of material is need to be done in following categories:

- Not needed at all – to be moved to red tag area.
- Needed but not now – need to be moved to store with yellow tag.
- Needed but not here – to be moved to red tag area.
- Needed but not so much quantity.

For purpose of doing sorting GSL need to be answered following questions:

- What is required?
- How much required?
- When it is required?
- Where it is required?

Sorted material depending upon category can be separated and made ready for movement/ shift, in order to segregate the sorted material; visual aid technique can be used by attaching coloured tags to each category of material (called visual sorting).

Following two categories of tag can be used:

Red tag – A card containing detailed information of 'unwanted things' with a given time limit for further action to be taken.

Yellow tag – A card containing detailed information of 'needed things', but not now with a given time limit for further action to be taken – usually kept in store.

Sorting can help GSL to identify:

a) Obsolete material; parts (jigs/tooling) not required as the design has become obsolete.
b) Defective material; part can't be used as it is.
c) Scrap material.
d) Material which not in place – kept at wrong place.
e) Unnecessary / extra / not useful material.

Sorting can also help GSL in reduction of material lying vacant on production floor, by segregating them into different categories and ensure that rarely used material either removed or tagged in red tape area. If material were sorted than 'loss of material' which was lying vacant near to assembly line during fire incident could be saved.

S2 - Set in order

Systemic arrangement by ensuring 'place for everything and everything in its place'.

Purpose is to save search time and eliminate motion waste, through visual management; with search-free and count free arrangement.

Colour can be best visual aid – RYGB

R – Red – Critical
Y – Yellow – Reorder
G – Green – Design
B – Blue – Excess

Note – Mapping of RYGB to feature is purely illustrative.

In order to implement systematic arrangement, GSL need to consider and answer :

- Analyse status.
- Decide – Which things will belong where?
- Decide – How they should be put away?
- Get everybody to follow rules through indexing, labelling etc.

Expected benefits of set in order to GSL

a) Faster retrieval of things results in elimination of search time.
b) Opportunity to correct the abnormalities faster as visibility improve by system itself.
c) Space saving by systematic arrangement.
d) Efficiency of work improves as things are available when they are actually needed.

Thus, S can solve the specifically problem of non-accessibility of tools.

S3 – Shine

Ensure there must be cleanliness 'in and of' everything. Obviously, if there less number of items, then there is less to clean.

- Cleaning should be with meaning.
- Cleaning is inspection (from all aspects – front, rear, left right, top and bottom).

Shine will help GSL to keep things in order with regular cleaning and upkeep, so that maintenance become 'preventive function' rather corrective and any incident, likewise fire occurrence on assembly-line; must be avoided. This will ensure larger utility out of Machine and Plants which will increase replacement cycle and save investment by lowering down maintenance and replacement cost.

S4 – Standardization

Establishing the 'standards' and make 'operating procedure' to create consistency and ensure that all steps are performed correctly. There are :

- Fix responsibilities for implementing & evaluating system.
- Integrate these responsibilities into routine work.
- Check how well the system is working and sustaining itself.

In order to ensure TPM all 5S are essential, but standardisation is key, GSL is facing large set of problem in assembly of electronic cycles and reason being absence of SOPs. Hence, by establishing the standardised process GSL can identify Critical Success Factors (CSFs) and benchmark the Key Performance Indicator (KPIs) against each CSFs.

S5 – Sustain

In order to sustain with the established standard, it is required to do;

- Daily monitoring
- Improving ownership by allocating areas
- Using 'red tag campaign'
- Communicating visually through fixed point photography
- Structured communication
- Continuous training of all employees
- Periodic audits at all level
- Motivating staff through recognition

Since 5S is not a onetime exercise, it is continuous process, hence, it is essential to sustain the practices followed during earlier 5Ss. GSL witness the high attrition rate at top management level, hence, it is important that GSL must inculcate practice of 5S in the system and work culture and sustain them on continuous basis, irrespective of attrition.

Sixth S is 'safety' which was added later on, in order to ensure safety while performing all the remaining 5S.

Further details can be tabled on requisition basis.

Closure of Report

Management Accountant

(For Management Accounting Division)

Gold Star Limited

Question 4 : Case Scenario [ICAI Website]

Derby Grey is a leading manufacturer of leather luggage bags (up to 62") for the style-conscious people around the globe. It is made up of two independent divisions in New Delhi. The division 'Mx' performs all manufacturing and packaging operations. All sales are made through the division 'Rx' which has 11 retail stores in New Delhi, as well as through Derby Grey's own well developed website. Derby Grey has also retail operations in Dubai, Kuala Lumpur, Bangkok as well as in Singapore. These overseas businesses operate as independent subsidiaries within the Division 'Rx'.

Derby Grey revolutionized the industry by offering cheap but stylish luggage bags. Derby Grey is able to keep its prices low by offering a very basic level of service. Luggage Bags are sold in boxes for customers to assemble themselves and all deliveries are made through third party distributor 'Çosta Cruise'.

Dr. Philips (Managing Partner) is bothered about increasing sales returns and massive complaints about product purchased from Derby Grey on social media. With this concern, Dr. Philips has appointed you as performance management expert to help the firm to execute six sigma technique to reduce number of sales returns and to evaluate firm's existing performance. Dr. Philips has heard that Six Sigma analysis involves large quantities of data. Dr. Philips stated–

"I'm not confident on our current IT systems. I doubt whether system would be able to identify the required data related to cutting, preparation, closing, lasting etc. These manufacturing sub divisions may be the root causes of the problem. Further, quarterly compiled sales return data has not enough detail. We may need to do more analysis on customer satisfaction and manufacturing quality."

You have been given access to feedback given by customers for returning goods to measure existing performance in this area (refer below):

Difficult to assemble or pieces missing (47%) – Bags were not as demanded (24%) – Poor Quality (19%) – Arrived damaged (9%) – Arrived late (1%)

Required :

ADVISE Managing Partner on Six Sigma implementation to reduce number of sales return using DMAIC method.

Solution 4 :

DMAIC is a methodology of Six Sigma used to improve existing business process. It is advisable to Managing Partner to execute following phases of DMAIC –

Define the Goal

This phase emphasizes exactly what customer's requirements are? In this case focus is precisely on why bags are returned. The objective of the process needs to be clear, as in this case it is to reduce the number of customer returns. Customers expect certain minimum requirements from the manufacturing and packaging process, for example, that the bags are properly packed in boxes. They also expect the goods be delivered undamaged within a reasonable time and delivered at the time and date when committed. Further, customer's perceptions of quality should coincide with the price paid, though different customers may have different expectations.

Measure the existing process

This phase measure the existing process to determine existing performance. In this case, the sales returns figures do not show complete picture as to why customers return bags, which of the class belong to 'poor packing', which one belong to 'defective item', which one belong to

'activities of other sub divisions' etc. The ambiguity of the data and classification of definitions will need to be addressed as to enable the process to be measured effectively.

Analyze

This phase detects the root cause of the problems. Possible root cause of sales return are as follows:

- Difficult to assemble or pieces missing (47%) – Returns could be because the bags were not manufactured or packed properly in the 'Mx' division, but could also be due to poor design, customers losing pieces or simply being unable to assemble bag.
- Bags were not as demanded and of poor quality (43%) – Returns could be due to defective manufacture or if the customer had merely changed their minds and no longer required the bag. In 'bags were not as demanded', the identification of 'defective items' are too vast.
- Arrived damaged (9%) – It may be that customers wrongly classified defective bags as damaged. Though bags may become damaged by the 'Çosta Cruise', only a small number of returns relate directly to them.
- Arrived late (1%) – Reasons of arrived late could be either 'Costa Cruise' could not make delivery on time or 'Mx' division could not complete order on time and this causes only 1% of returns, is relatively insignificant.

Further, information could be analyzed, like country wise sales returns, product wise sale return, or with more clear definition of 'defective items' from customer's perspective. By doing so, firm may easily get information related to areas of the business where sales returns are high and hence be able to focus on.

Improve

In this phase, recommendations are made to minimize or eliminate the root cause of the problem and then those recommendations are implemented to improve the process in a systematic manner. Derby Grey is required to consider aspects of production and packaging which could be improved, for example, timely repair and maintenance of equipment or training to existing staff etc. Further, availability of resources and likely costs of making the improvements need to be carefully considered. Derby Grey may have to talk to 'Costa Cruise' for damage during transportation and delay in delivery, so that 'Costa Cruise' may improve their own system.

Control

Here control means maintaining the improved performance and future performance. Derby Grey would be required to monitor the performance on ongoing basis. If sales return reach above particular level, it should be reported to responsible person and he should act immediately.

In addition, Derby Grey need to redesign IT system in such a way so that it can provide required details. Since this is continuous monitoring so it may also require revisiting of some phases in DMAIC.

TOTAL PRODUCTIVE MAINTENANCE (TPM)

Question 5 :

A company using a continuous manufacturing operation achieves an output of 3 kg. per hour. The selling price is Rs. 450 per kg. The raw material cost is Rs. 125 per kg. of output and the direct labour and variable overheads amount to Rs. 316 per kg. of output. The company has provided an expenditure of Rs. 640 on maintenance and Rs. 6,400 on breakdown repairs per month in its budget. Breakdowns averaging 300 hours per month occur due to mechanical faults. These could be reduced or eliminated, if additional maintenance on the following scale were undertaken :

Breakdown hours	Maintenance Costs (Rs.)	Repair Costs (Rs.)
0	20,480	0
60	10,240	1,920
120	5,120	2,560
180	2,560	3,840
240	1,280	5,120
300	640	6,400

Using the incremental cost and incremental revenue concept, you are required to :

i) Determine the optimum level upto which breakdown can be reduced to increase production.

ii) Calculate the additional profits obtainable at that level as compared to the present situation.

Solution 5 :

1. Calculation of contribution per hour -

Sales price per kg	(Rs.)	450
Variable cost per kg [125 + 316]	(Rs.)	441
Contribution per kg	(Rs.)	9
Output per hr.	(kg)	3
Contribution per hr. (9 x 3)	(Rs.)	27

2. Effective break down cost / month –

Particulars	Breakdown hours					
	0	60	120	180	240	300
a. Maintenance cost (Rs.)	20,480	10,240	5,120	2,560	1,280	640
b. Repairs cost (Rs.)	0	1,920	2,560	3,840	5,120	6,400
c. Opportunity cost @ 27/ hr. (Rs.)	0	1,620	3,240	4,860	6,480	8,100
d. Total effective cost (a + b + c)	20,480	13,780	**10,920**	11,260	12,880	15,140

Decision : Considering lowest effective cost Rs. 10,920 p.m., it is advisable to go for 120 hrs. break downs p.m. as compared to present 300 break down hrs. p.m.

This will result into a cost saving (i.e. profit) = (15,140 – 10,920) = Rs. 4,220 p.m.

Question No. 6 : [Nov. 2019 Exam]

APZ Company Ltd. manufactures spare parts and can be called "high volume based" manufacturing environment. The company is using the system of Total Productive Maintenance for maintaining and improving the integrity of manufacturing process. There are several different automated manufacturing machines located in the plant, through which manufacturing of spare parts are done and supplied to cater the demand in the market.

A 12 hour shift is scheduled to produce a spare part in APZ Company Ltd. as shown in the schedule below. The shift has three 15 minute breaks a 10 minute clean up period.

Production Schedule for Automated Machine A 10 :

Cycle : 10 (seconds),

Spare parts Manufactured : 3360 units,

Scrap : 75 units,

Unplanned Downtime : 36 minutes

Required :

(i) Calculate OEE (Overall Equipment Effectiveness) and comment on it.

[6 Marks]

(ii) The management of company has decided to ensure that things are done right the first time and that the defects and waste are eliminated from operations. Thus they are planning to implement Total Quality Management (TQM) also.

Summarize the connection between Total Quality Management (TQM) and Total Productive Maintenance (TPM). [4 Marks]

Solution No. 6 :

Key Calculations :

Particulars		Minutes
Total time available in a shift of 12 hours [12 hours x 60 minutes]		720
Less : Planned downtime : Breaks (15 min x 3) Clean up period		 45 10
∴ Planned production time		665
Less : Unplanned downtime		36
∴ Effective time actually worked		629
Standard time allowed for actual output [3360 units x 10 second cycle] / 60 seconds		560

(i) Calculation of OEE :

Availability Ratio :

$$= \frac{\text{Actual time available per shift}}{\text{Planned production time per shift}} \times 100$$

$$= \frac{[629 \text{ min.}]}{[665 \text{ min.}]} \times 100$$

$$= 94.59\%$$

Performance Ratio (i.e. Efficiency Ratio) :

$$= \frac{\text{Standard time required for actual output}}{\text{Actual time taken for actual output}} \times 100$$

$$= \frac{(560 \text{ minutes})}{(629 \text{ minutes})} \times 100$$

$$= 89.03\%$$

Quality Ratio :

$$= \frac{\text{Number of units accepted}}{\text{No. of units produced}} \times 100$$

$$= \frac{(3360 - 75) \text{ units}}{3360 \text{ units}} \times 100$$

$$= 97.77\%$$

OEE Ratio :

OEE % = Availability × Performance × Quality

= 94.59% x 89.03% x 97.77%

= 82.34%

Comments :

Since OEE of APZ Co. Ltd. is lesser than 85% i.e. World Class Performance Level, company is advised to improve its each ratio i.e. availability ratio, performance ratio and quality ratio. It can be done by collecting information related to all downtime and losses on machines, analyzing such information through graphs and charts, making improvement decisions thereon like autonomous maintenance, preventive maintenance, reduction in set up time etc. and implementing the same.

(ii) Connection between TQM and TPM :

The connection between TQM and TPM is summarized below :

- TQM and TPM make company more competitive by reducing costs, improving customer satisfactions and slashing lead times.
- Involvement of the workers into all phases of TQM and TPM is necessary.
- Both processes need fundamental training and education of participants.
- TPM and TQM take long time to notice sustained tangible benefits.
- Commitment from top managements is necessary for successful implementation.

Question 7 : [RTP - May 2021]

Topic : Overall Equipment Effectiveness (OEE)

Sheetal Bearing Balls Limited (SBBL) is the famous name for bearing balls of different sizes. Mr. Syal recently joined as Manager Production and Operations at Unit 3 of Ludhiana (in Punjab) plant of the SBBL, wherein 10mm diameter steel ball bearings for bicycles are manufactured. The plant is largely automated and equipped with the latest technology machines.

From Mr. Singh, Plant Accountant Mr. Syal come to know that since machines are of the latest technology and workers are motivated due to the liberal workman policy of SBBL, hence productivity and quality was never an issue, but availability is. Over lunch, when Mr. Syal greets Mr. Kumar, Plant Head, he also expresses his worry over excessive downtime and optimal use of limiting factors.

Mr. Syal, while navigating the ERP and reviewing the files & other documents handed over to him, which was prepared and maintained by his predecessor; comes across the OEE rate of 93.555% measured during last week for machine '107-10M-Bearing' (which is a limiting factor – caused bottleneck activity) during a normal shift. Since the said machine has a high-performance rate of 105%; hence Mr. Syal decided to dig deep into the composition of OEE.

In the normal shift of 9 hours, workers are allowed to take 2 short breaks of 15 minutes each and a lunch break of 30 minutes. During such a normal shift, out of the total manufactured 27,216 bearing balls by said machine, only 272 balls are found defective.

Required :

(i) DETERMINE the unplanned downtime witnessed by machine 107-10M-Bearing and advise Mr. Syal, the best way-out to reduce the same (in brief).

(ii) MEASURE the Ideal Cycle Time to manufacture a single bearing ball.

(iii) APPLY, Goldratt's five steps that can be applied to remove the bottleneck at the Ludhiana plant of SBBL.

Answer 7 :

Approach : If you read the question very carefully, then you will notice that this question is to be solved in a reverse manner, using the formula of OEE.

We can calculate Quality Ratio using total units produced and defective units produced. OEE Ratio and Performance Ratio is given in the question. We will get Availability Ratio using the equation of OEE.

Using Availability Ratio, we can calculate Actual working time. Planned downtime is given in the question, now we will get unplanned downtime as balancing figure.

(i) Calculation of Unplanned downtime of Machine 107-10M-Bearing :

Working 1 : Planned Production Time

Particulars	Minutes/shift
Total possible time (9 hours x 60 minutes)	540
Less : Short breaks (2 breaks x 15 minutes) - planned	30
Meal break - planned	30
Planned production time	480

Working 2 : Quality Rate

Particulars	Units
Total units produced (given)	27,216
Less : Defective units (given)	272
Hence, Good units produced	26,944
Quality Rate (26,944 units / 27,216 units) = 99.00%	

OEE = Availability Rate x Performance Rate x Quality Rate

93.555% (given) = Availability Rate x 105% (given) x 99% (as above)

Hence, Availability Rate = 90%

Availability Rate = Net operating time / Planned production time

90% = Net operating time / 480 Min.

Hence, Net operating time = 432 minutes (i.e. actual time)

Unplanned downtime = Planned production time - Net operating time

= 480 min. - 432 min = **48 minutes**

Advise – In order to reduce the unplanned downtime, preventive maintenance shall be practiced either before or after each shift; and the **shine (out of 5S)** principle shall be adopted by the workman as part of the TPM initiative. It is expected that the time spent on preventive maintenance will be less than the current unplanned downtime of 48 minutes.

(ii) Ideal Cycle Time to manufacture a single bearing ball :

Ideal time means, standard time. We need to calculated standard time required to produce each unit.

Performance Rate = Standard time / Actual time

105% = Standard time / 432 Min.

Hence, Standard time = 453.6 minutes (i.e. ideal time)

It means, standard time required to manufacture 27,216 units is 453.6 minutes

Output per minute = 27,216 units / 453.6 min. = 60 units per minute

i.e. 60 units per 60 seconds and hence 1 unit per second.

So, standard time required to manufacture a single bearing ball (i.e. ideal cycle time) is **1 (one) second** (453.6 minutes x 60 / 27,216 units) i.e. 60 bearing balls per minute.

(iii) Goldratt's five steps to remove the bottleneck at Ludhiana plant of SBBL :

Goldratt's theory of constraints describes the following mentioned five steps process of identifying and taking steps to remove the bottlenecks that restrict output.

1. **Identifying the System Bottleneck** - at unit 3 of Ludhiana plant of SBBL, 107-10M-Bearing is a limiting factor hence activity performed using this equipment is bottleneck activity.

2. **Exploit the Bottlenecks** – Limiting factor (Bottleneck's activity capacity) must be fully utilized and that too optimally. Currently the overall equipment effectiveness is already 93.555%, attention on the possibility to enhance the same is needed. Like preventive

maintenance shall be practiced to avoid unplanned downtime. OEE above 85% is already considered as a world class performance.

3. **Non-bottleneck activities are subordinate** – Bottleneck activity should set up the pace for non-bottleneck activities. Production units shall plan their production keeping respective limiting factors at the centre point, because even if the efficiency of non-bottleneck activity is enhanced, the same may be worthless due to scarcity of bottleneck activity.

4. **Elevate the bottleneck** – Eliminate the bottleneck by enhancing the capacity and efficiency. Major change (business reengineering) or continuous minor change (kaizen) may achieve this goal.

   Note – There will always be one bottleneck in the system, if such bottleneck is eliminated then a new constraint emerges as a bottleneck. Hence this process is continuous. Ultimately improvement is a never ending continues process.

5. **Repeat the process** – Apply steps 1 to 4 to new bottleneck activity which emerges at different production units of Ludhiana plant of SBBL and repeat the process.

Business Process Reengineering (BPR)

Question 8 : Case Scenario [ICAI Website]

ANI is a government-owned bank. The Bank has over 2,500 branches in country 'A' spread over all states / union territories including specialized branches. These branches are controlled through 27 Zonal Offices and 4 NBG Offices. As a government owned bank, it has usually been the first preference for customers while choosing a bank.

In the last six years, the Government has permitted a number of foreign banks to operate within the country in order to solve the problem of foreign exchange shortage and open up foreign trade as an instrument to promote economic development. These foreign banks offer diverse range of services such as direct access to executive management, a single point of contact to coordinate all banking needs, appointment banking to save time, free online banking services 24/7, free unlimited ATM access etc.

In contrast, ANI has very elementary information systems, covering only internal transaction handling and accounting activities. Customers have to visit banks to carry out transactions like-checking bank balance, cash deposit and withdrawals, transferring money from one account to another in operational hours. Often customers complain about the amount of time taken to complete a task, as the employees and clerical staff of the bank can attend only few customers at a time. Customer service evaluation has never been undertaken by ANI.

Other processes, new account applications, are complex, requiring verification of many documents and other formalities. Board of Directors were worried from growing popularity of new style banks. The Board of Directors of ANI has recently held meeting to discuss the shortfalls in its current services and the need to reengineer the ANI's business processes.

Required :

ADVISE how Business Process Reengineering (BPR) can be used to improve ANI's current processes.

Solution 8 :

BPR is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvement in critical contemporary measures of performance, such as cost, quality, service and speed. In other words, BPR is concerned with the result of the process (i.e. with those activities that add value to the process).

To implement BPR, firstly, each business process of ANI needs to be divided into a series of processes. Then each business process requires to be documented and analysed to find out whether it is essential, whether it provides support to other valuable processes and whether it is adding value. Any process which does not add value or does not provide essential support to the value adding activities must be removed. Those processes that remain, are required to be re-engineered / re-structured to make them as efficient as possible. For ANI, new technology, like ERP solutions should be introduced to improve these processes. However, ANI must ensure that the statutory compliances regarding these processes are not undermined.

ANI is facing a hyper-competitive marketplace where customers expect a superior experience. BPR activities would help ANI in understanding those processes which ANI's customers value the most and remove those that are not valued. Foreign banks are offering diverse range of services such as direct access to executive management, a single point of contact to coordinate all banking needs, appointment banking to save time, free online banking services 24/7, free unlimited ATM access etc. Clearly these are valuable business processes valued by the customer. ANI should incorporate all these facilities in their banking processes to enhance customer satisfaction and service level.

Opening of new accounts in ANI is complex processes since it requires multiple forms to be complied with. Through BPR, ANI would analyse the whole process and identify the need for only one form that contain all of the necessary customer information. Further, it is also possible to initiate opening of new account through the development of an online application form on ANI's website. Online entry would remove the possibility of forms being lost or incorrect, again enhancing customer satisfaction since customers need not to visit ANI's branch to open account. There should also be online system for authentication / validations as to ensure that data fields are correctly filled in by customers. This would also remove unnecessary staff activities in checking and re-processing forms.

It is likely that BPR may increase costs in short-term, as investment in information technology or ERP solutions. However, this would also reduce substantial levels of manual activities and processes, thereby providing speedy services to customers. In long term, this would result in cost saving, high levels of efficiency, profitability and better levels of customer satisfaction and retention.

Question 9 : [ICAI Module]

ANA is one of Country 'I''s top footwear companies and other equipment. Since its foundation in 1988, ANA has been one of the all-inclusive footwear brand that is committed to nurturing the youth across the world through sports to contribute to society. Over more than three decades, the company inherits its values and provides own products while capturing the changes in the social environment. It's state-of-the-art production facilities are located strategically across the Country 'I' and produces all kinds of footwear. ANA is best known for its high ethical standards towards its workers, suppliers and the environment and voluntarily publish CSR report every year.

Organizational Structure and Footwear Market

ANA is organized into conventional functional departments such as procurement on order basis, sales, and finance, most of which have their non-reliable excel sheet-based systems for planning and reporting. Consequently , it often fails to generate accurate, timely and consistent information to monitor its own performance, thus, company faces failures in achieving the performance and delivery targets set by its retail customers.

In Country 'I', footwear market is competitive and seasonal. Retailers, who are ANA's customers, for

footwear, they have two main demands, they want –
(i) footwear at lower prices to pass it on to consumers.
(ii) suppliers to meet performance and delivery targets relating to lead times and quality.

In order to comply with the retailer's demands, ANA's competitors have discontinued all their own manufacturing facilities and outsourced all production to suppliers, who have much larger production lines and lower costs. To reduce the shipment cost over long distances, competitors have invested in advanced procurement software to consolidate orders so that each 40-foot shipping container gets fully loaded. Purchase invoice processing is also automated via the integration of information systems into the supplier's software.

Proposal of Outsourcing
In order to mitigate costs, it has been proposed to outsource the manufacture of footwear, to a Chinese Supplier 3,750 km away. A comparison of the average cost of manufacturing and the cost of outsourcing footwear is given below-

Particulars	Manufacturing	Outsourcing
Average manufacturing cost per pair	BND 625	
Purchase cost per pair		CNY 28

Notes -
Country 'I's home currency is the BND.
Exchange Rate 1 CNY = 18 BND.

In addition to the purchase cost from the supplier, ANA will be subject to pay for shipping costs at the rate of BND 40,000 for each large, standard sized shipping container, regardless of the number of units in it. Each container contains 5,000 pairs when fully loaded.

Custom tariffs are expected to change soon, footwear imports into ANI's home country might be subject to 10% basic custom duty (plus 10% social welfare surcharge on duty) on the assessable value of imports excluding shipping costs.

Therefore, to implement the proposal restructuring of functional departments into multi-disciplinary teams are needed to serve major buyer accounts. Each team is required to perform all activities, related to the buyer account management from order taking (sales order) to procurement to arranging shipping and after sales services. Team members dealing with buyers will work in ANA's corporate office, while those like QC etc. managing quality and supplier audits, will work at the manufacturing site of Chinese Supplier. Teams will be given greater independence to selling prices to reflect market conditions or setting a price based on the value of the product in the perception of the customer. Many support staff will work as helper roles, or be offered new job opportunities overseas after the restructuring.

Expert Advise :
Prof. WD, Performance Management Consultant has advised ANA that the proposal has features of re-engineered processes and can be defined as business process re-engineering (BPR). Prof. advised, for evaluating the proposal, ANA should consider software development for full front-end order entry, purchasing, and inventory management solution which may be required along with ethical aspect of the proposed changes.

Required :
(i) ADVISE on information system which would be required for the reengineering.
(ii) ASSESS the likely impact of reengineering on the ANA's high ethical standards and accordingly on business performance.
(iii) EVALUATE how the BPR proposal can improve ANA's performance in relation to retail customers.

Answer 9 :

(i) Advise on Information System :

Combining several jobs into one, permitting workers to make more decision themselves, defining different versions of processes for simple cases v/s complex ones, minimizing situations when one person check someone else's work, and reorganizing jobs to give individuals more understanding and more responsibility are characteristics of re-engineered processes.

In ANA, outlays can be saved by rearranging staff into multidisciplinary teams, for example, reducing number of excess staff at different stages – cutting, preparation, finish etc. These savings can be utilized in additional costs such as investment in new information systems. Hammer and Champy stress the use of information technology as a catalyst for major changes. BPR organizes work around customer processes rather than functional hierarchies.

Presently, ANA's departments have their own excel sheet-based systems for planning and reporting which is unreliable and inconsistent. They are inadequate to provide the accurate, timely and consistent data which ANA needs to meet its own performance and delivery targets. There must a shared database that should be accessible by all parts of the functional teams. This should have real time updation, so that employees in different time zones can use updated data. The database should include financial data and non-financial data, like cost information, data related to lead times and quality. Information systems must be featured with all required reports like performance report, budget report etc.

In addition, ANA is required to invest in special system as advised by Prof. WD for full front-end order entry, purchasing, and inventory management solution to minimize shipping costs by ensuring that the shipping containers get fully loaded and to integrate with supplier's information systems to automate purchase invoicing.

Overall, ANA must analyze that whether the benefits due to information technology are worthy.

(ii) Assessment of Likely Impact of Re-engineering on Ethical Standards :

Workers :

ANA is famous for its high ethical standards towards workers and staff. Because of adopting BPR proposal, manufacturing staff are likely to be unemployed. Competitors, have already shutdown their factories, these workers may not be able to find similar jobs.

Employees who continue in work may become disappointed if they think the application of BPR is detrimental to their interest. This may reduce productivity, increase staff turnover or difficulties in recruiting new staff. In addition, they may also be demotivated if they are appointed on unfamiliar roles, or may not be willing to learn new skills.

Some of staff members may be motivated by the opportunity to perform new types of work, learn new skills or work outside India. This may enhance their individual performance.

Suppliers :

Any association with non-ethical practices, for example, if the Chinese supplier is indulged in using non-acceptable working practices, could seriously spoil ANA's reputation for high ethical standards. This could undermine financial performance because customers may not buy its products, or possible investors might refuse from providing capital. Staff members located at the manufacturing sites are responsible for supplier audits, which may assist to mitigate this risk.

Environment :

ANA should consider the environmental impact of importing goods from long distances. The environmental related credentials of the Chinese Supplier are not known. Since, ANA voluntarily publishes a corporate sustainability report, any distortion in its performance on environmental issues might undermine the financial performance.

(iii) Evaluation of BPR Proposal in relation to Retailer's Demand :

Lower Prices

In order to sell footwear at lower prices, there is a proposal to reduce costs by outsourcing production to supplier. The current average production cost of manufacturing is BND 625 per unit. The cost of purchase from an external supplier works out to be BND 512 as landed cost. That is purchase cost + shipping cost.

BND 504 (CNY18 x BND28) purchase cost, *plus* BND 8 (BND 40,000 / 5,000) shipping cost. This 18.08% (113/625) saving is a substantial improvement in financial performance, but not a dramatic one. It may be noted that BPR is a methodology that should be applied only when radical or dramatic change is required. Further, exchange rate movements may also slash the cost saving significantly. In the near future, expected changes to international trade tariffs will increase the unit cost to CNY 31.08 (CNY 28.00 x 111%) i.e. 559.44 in BND and reduce the cost saving to just 10.49% (65.56 / 625).

Meeting Performance Targets

Lead times

Current lead times for customer orders are not ascertainable. Since the proposed Chinese Supplier is 3,750 km away, consignment will take several weeks to be imported by sea. This may increase lead times substantially, although may be set off by faster production times in supplier's plant. As ANA's sales are seasonal, retailers may order in advance, decreasing the long lead times. In order to decrease shipping costs, shipping containers must be full, meaning that deliveries must be in larger quantities.

Quality

ANA is already known for manufacturing high quality footwears. The quality of the new supplier's footwear needs to be checked. Any distortion in the quality of footwear will deteriorate its reputation and decrease long-term business performance since only few customers would order. Quality standards checking is more difficult while using outside suppliers, especially at long distance, than manufacturing in ANA's own factory. In BPR, work is done where it makes most sense to do so. In this aspect, having employees responsible for quality checking and supplier audits (working at the manufacturing site abroad) will assist ANA in sustaining the best supplier relationship management.

Just in Time System (JIT)

Question 10 : [ICAI Module]

A manufacturer is considering implementing Just in time inventory system for some of its raw material purchases. As per the current inventory policy, raw materials required for 1 month's production and finished goods equivalent to the level of 1 week's production are kept in stock. This is done to ensure that the company can cater to sudden spurt in consumers' demand. However, the carrying cost of inventory has been increasing recently. Hence, the consideration to move to a more robust just in time purchasing system that can reduce the inventory carrying cost. Details relevant to raw material inventory are given below:

- Average inventory of raw material held by the company throughout the year is ₹ 1 crore. Procurement of raw material for the year is ₹ 12 crore. By moving to just in time procurement system, the company aims at eliminating holding this stock completely in its warehouse. Instead, suppliers of these materials are ready to provide the goods as per its production requirements on an immediate basis. Suppliers will now be responsible for quality check of raw material such that the raw material can be used in the assembly line as soon as it is delivered at the company's factory shop floor.

- Increased quality check service done by the suppliers as well as to compensate them for the risk of holding the inventory to provide just in time service, the company is willing to pay a higher price to procure raw material. Therefore, procurement cost will increase by 30%, total procurement cost will be ₹ 15.6 crore per year. Consequently, quality check and material handling cost for the company would reduce by ₹ 1 crore per year. Similarly, insurance cost on raw material inventory of ₹ 20 lakh per year need not be incurred any longer.
- Raw material is stored in a warehouse that costs the company rent of ₹ 3 crore per annum. On changing to Just in time procurement, this warehouse space would no longer be required.
- Production is 150,000 units per year. The company plans to maintain its finished goods inventory equivalent to 1 week's production. Despite this, in order to have a complete cost benefit analysis, the management is also factoring the possibility of production stoppages due to unavailability of raw material from the suppliers. This could happen due to of delay in delivery or non-conformance of goods to the standard required. Labor works in one 8 hour shift per day and will remain idle if there is no material to work on. Due to stoppage of production for the above reason, it is possible to have stockout of 3,000 units in a year. Stockout represents lost sales opportunity due to unavailability of finished goods, the customer walks away without purchasing any product from the company. Therefore, in order to reduce this opportunity cost and to make up for the lost production hours, labor can work overtime that would cost the company ₹ 10 lakh per annum. This is the maximum capacity in terms of hours that the labor can work. With this overtime, stockout can reduce to 2,000 units.
- Currently, sale price is ₹ 5,000 per unit, variable production cost is ₹ 2,000 per unit while variable selling, general and administration (SG&A) cost is ₹ 750 per unit. Raw material procurement cost is currently ₹ 800 per unit, that will increase by 30% to ₹ 1,040 per unit under Just in time inventory system.
- On an average, the long-term return on investment for the company is 15% per annum.

Required :

(i) CALCULATE the benefit or loss if the company decides to move from current system to Just in Time procurement system.

(ii) RECOMMEND factors that the management needs to consider before implementing the just in time procurement system.

Answer 10 : [This answer is slightly modified by me]

(i) Calculation of Incremental Profit / Loss due to switching over to JIT System :

Particulars	Current Purchasing Policy (₹)	JIT Procurement System (₹)
Raw material procurement cost per year	12,00,00,000	15,60,00,000
Quality check and material handling cost (No longer required in JIT)	1,00,00,000	---
Insurance Cost on raw material inventory (No longer required in JIT)	20,00,000	---
Warehouse rental for storing raw material (No longer required in JIT)	3,00,00,000	---
Overtime Charges under JIT to reduce Stockouts (WN 1 below)	---	10,00,000

Stockout Cost (WN 2 below)	---	40,20,000
Total Relevant Cost	16,20,00,000	16,10,20,000

Therefore, moving to just in time procurement system results in savings of ₹ 980,000 per year for the company. If reinvested, long term return on investment for the company at 15% would yield a return of ₹ 147,000 per year. Therefore, total benefit for the company would be ₹ 11,27,000 per year.

Working Notes :

Note 1: Should overtime cost be incurred to reduce stockouts?

Contribution per unit = Sale price - Variable production cost - Variable SG&A OH

Revised Variable production cost under the just in time system

= ₹ 2,000 + ₹ (1,040 - 800) = ₹ 2,240 per unit

Contribution per unit = ₹ 5,000 - ₹ 2,240 - ₹ 750 per unit = ₹ 2,010 per unit.

Overtime cost can reduce stockout from 3,000 units to 2,000 units that is customers' demand of 1,000 units more can be met.

Contribution earned from selling these 1,000 units = 1,000 × ₹ 2,010 per unit = ₹ 20,10,000.

Therefore, the contribution earned of ₹ 20,10,000 is more than the related overtime cost of ₹ 10,00,000. Therefore, it is profitable to incur the overtime cost.

Note 2 : Stockout Cost :

Out of the total shortfall of 3,000 units, by spending on overtime 1,000 units of demand can be met. Therefore, actual stockout units is only 2,000 units. As explained above, contribution per unit is ₹ 2,010 per unit. Hence, stockout cost = 2,000 units × ₹ 2,010 per unit = ₹ 40,20,000.

Student Note : ICAI has assumed that there is no stock out at present. It will occur only under JIT system.

(ii) The company plans to eliminate its raw material inventory altogether. Raw material will be delivered as per production schedule directly at the factory shop floor, from where production will begin. The management should therefore carefully consider the following points:

(a) The entire production process has to be detailed and integrated sequentially. This is essential to know because it should be known in advance when in the sub-assembly process each raw material is required and in what quantity.

(b) Since production is dependent on delivery and quality of raw material, heavy reliance is being placed on suppliers. They should be able to guarantee timely delivery of raw material of the appropriate quality. The company is paying a premium of 30% of original cost, that is ₹ 240 per unit extra in order to ensure the same. Each unit gives a contribution of ₹ 2,010 per unit, which is 40.2% of the sale price per unit. Lost sales opportunities due to unavailability of raw material or non-conformance of the material can result in substantial losses to the company. While, portion of this has been factored while doing the cost benefit analysis of implementing Just-in-time systems, it needs careful consideration and monitoring even after implementation. Therefore, to hedge its loss, the management and suppliers should agree on penalties for the suppliers for any delay or nonconformance in quality of materials beyond certain thresholds.

(c) Accurate prediction of sales trends is important to determine the production schedule and finished goods planning.

(d) Continuous monitoring of the system even after implementation is essential to ensure smooth operations. Management commitment and leadership support is essential for its successful implementation and working.

Question 11 : [Nov. 2019 Exam]

Pixel Limited is a toy manufacturing company. It sells toys through its own retail outlets. It purchases materials needed to manufacture toys from a number of different suppliers. Recently, due to the entry of few reputed foreign brands in the toy market and particularly in the segment in which Pixel Ltd. is doing business, it is facing a threat to operate profitably.

Each toy requires 4 kg. of materials at ₹ 19 per kg. and 5% of all materials supplied by the suppliers are found to be substandard. Labour hour requirement for each toy is 0.4 hour at ₹ 120 per hour.

Market research has determined that the selling price will be ₹ 240 per toy. The company requires a profit margin of 15% of the selling price. Expected demand for toy in the coming year will be 50,000 toys. Sales and variable overhead per unit for the four quarters of the year will be as follows:

Particulars	Q1	Q2	Q3 (Festive season)	Q4 (Festive season)
Sales (units)	7,500	9,000	15,500	18,000
Variable overhead per unit (₹)	22	22	24	25

Total fixed overheads are expected to be ₹ 6,25,000 for each quarter.

The production manager has decided to produce 12,500 units in each quarter. Inventory holding costs will be ₹ 18 per unit of average inventory per quarter. Inventory holding costs are not included in above.

Normal production capacity per quarter is 15,000 toys. The company can produce further up to 6,000 units per quarter by resorting to overtime working. Overtime wages will be at 150% of normal wage rate.

Assume zero opening inventory.

Required :

(a) (i) Calculate the cost gap that exists between the total cost per toy as per the production plan and the target cost per toy. [9 Marks]

(ii) Discuss how just-in-time purchasing and just-in-time production will remove the cost gap calculated in (i) above. Show calculations in support of your answer. [7 Marks]

(b) Explain, how implementation of JIT production method can be a major source of competitive advantage and success of the company. [4 Marks]

Answer 11 :

(a) (i) : Calculation of Target Cost per toy :

= Selling Price - Profit

= ₹ 240 - 15% of sales price = ₹ 204

Calculation of cost as per Present Production Plan :

At present, production manager has decided to produce 12,500 units in each quarter, irrespective of sales. This production is within normal capacity of 15,000 toys per quarter. Hence, no overtimes wages will be incurred. However, we will have to incur inventory holding cost on average inventory.

Inventory Holding Cost :

Particulars	Q1	Q2	Q3	Q4	Total
Opening stock (Units)	0	5,000	8,500	5,500	
Add : Production (units)	12,500	12,500	12,500	12,500	50,000
Less : Sales (units)	(7,500)	(9,000)	(15,500)	(18,000)	50,000
∴ Closing Stock (units)	5,000	8,500	5,500	0	
∴ Average Stock (units)	2,500	6,750	7,000	2,750	
Inventory holding cost (₹) @ ₹ 18 per unit	45,000	1,21,500	1,26,000	49,500	3,42,000

Calculation of cost of production for 50,000 units :

Particulars	Per Unit (₹)	Total (₹)
Cost of Raw Material [4 kg. @ ₹ 19 per kg.] x 100/95	80	40,00,000
Labour cost [0.4 hour @ ₹ 120 per hour]	48	24,00,000
Variable Overheads [(22 x 12,500 units) + (22 x 12,500) + (24 x 12,500 units) + (25 x 12,500 units)]		11,62,500
Fixed Overheads [6,25,000 per quarter x 4 quarters]		25,00,000
Inventory holding cost [as per above working]		3,42,000
∴ Total Cost		1,04,04,500
∴ Total Cost per unit [1,04,04,500 / 50,000 units]	208.09	
∴ Cost gap per toy [208.09 - 204]	4.09	

(a) (ii) : Calculation of cost as per JIT system :

Under JIT system, we will produce only as much as we can sell. Similarly, we will purchase the raw material only as much required for production. Under JIT, we won't carry any stock of finished goods, hence there will be no inventory holding cost. However, we will have to incur overtime wages beyond normal capacity of 15,000 toys per quarter.

Under JIT, Sales Qty. = Production Qty. for each quarter.

Calculation of cost of production for 50,000 units :

Particulars	Per Unit (₹)	Total (₹)
Cost of Raw Material [4 kg. @ ₹ 19 per kg.] x 100/95	80	40,00,000
Labour cost [0.4 hour @ ₹ 120 per hour]	48	24,00,000
Overtime Premium @ 50% of normal wages : Q3 : [15,500 - 15,000 units] x ₹ 24 = 12,000 Q4 : [18,000 - 15,000 units] x ₹ 24 = 72,000		84,000
Variable Overheads [(22 x 7,500 units) + (22 x 9,000) + (24 x 15,500 units) + (25 x 18,000 units)]		11,85,000
Fixed Overheads [6,25,000 per quarter x 4 quarters]		25,00,000
∴ Total Cost		1,01,69,000
∴ Total Cost per unit [1,01,69,000 / 50,000 units]	203.38	
Note : The revised cost is below the target cost of ₹ 204 per toy.		

Alternate view of ICAI :

ICAI answer has assumed that under JIT system, there will be no substandard material from suppliers. Which means, our suppliers will supply best quality raw material and hence the adjustment of 5% substandard material will not be required. In such case, material cost per unit shall be = (4 kg. @ ₹ 19 per kg) = ₹ 76 per unit of output. This will result in to a further savings of (₹ 4 per unit x 50,000 units) = ₹ 2,00,000 per annum. Thus the revised total production cost shall be (1,01,69,000 - 2,00,000) = ₹ 99,69,000 per annum.

As the question is completely silent about such saving under JIT system, I have preferred to calculate it by ignoring such savings. ICAI has considered both the views as correct.

(b) How implementation of JIT production method can be a major source of competitive advantage and success of the company :

JIT system has five main features as follows :

- Organise production in manufacturing cells, a grouping of all the different types of equipment used to make a given product. Materials move from one machine to another where various operations are performed in sequence. Material handling cost are reduced.
- Hire and retain workers who are multi-skilled so that they are capable of performing a variety of operations, including repairs and maintenance tasks. Thus, labour idle time gets reduced.
- Apply TQM to eliminate defects. As, there are tight link stages in the production line, and minimum inventories at each stage, defect arising in one stage can hamper the other stages. JIT creates urgency for eliminating defects as quickly as possible.
- Place emphasis on reducing set-up time which makes production in smaller batches economical and reducing inventory levels. Thus, company can respond to customer demand faster.
- Carefully selected suppliers capable of delivering high quality materials in a timely manner directly at the shop floor, reducing the material receipt time.

This will have the positive impact on the business like :

- Meeting customer demand in a timely manner
- Providing high quality products and
- Providing products at the lowest possible total cost.

Question 12 : [RTP – May 2020]

Pearson Metal and Motor Works (PM2W) deals in manufacturing of the copper wired electronic motor, which is specifically designed. PM2W is thinking to shift from traditional system to JIT system as part of process innovation.

CEO among the other top bosses at PM2W are hopeful that implementation of JIT will not only improve value in value chain for end consumer, but also improve overall manufacturing cycle efficiency. JIT pre-implementation team was formed to evaluate the probabilities, which collects following actual and estimated data about process :

Activity Category	Traditional System (Actual)	JIT System (Estimated)
Inspection	40	30
Storage	80	20
Moving	20	10
Processing	60	40

All data in minutes

Further, PM2W decided to practice single piece flow under JIT. PM2W received an order which is due to manufacture and delivered for 10 such motors. Total available production time to produce what customer demands is 480 minutes out of which it normal practice that 30 minutes will be spent in shutdown and cleaning. CEO is also considering JIT purchase apart from JIT production.

Required :

(i) EXPLAIN just in time.

(ii) CALCULATE the 'takt time' and INTERPRET the results.

(iii) ADVISE whether company should shift to JIT.

Answer 12 :

(i) Just-in-time (JIT) is a collection of ideas that streamline a company's production process activities to such an extent that wastage of all kind viz., of time, material and labour systematically driven out of the process with single piece flow after considering takt time.

In JIT, production facility is required to be integrated with vendor system for signal (Kanban) based automatic supply which depends upon demand based consumption. Under JIT system of inventory storage cost is at lowest level due to direct issue of material to production department as and when required and resultantly less/no material lying over in store or production floor.

Prerequisite of JIT system is integration with vendor, if vendor is not integrated properly or less reliable, then situation of stock out can arise and which can result into loss of contribution. Multitasking by employee is another key feature of JIT, group of employees should be made based upon product instead based upon function. Hence, functional allocations of cost become less appropriate. Overall, JIT enhance the quality into the product by eliminating the waste and continuous improvement of productivity.

(ii) Takt Time is the maximum available time to meet the demands of the customer; this will help to decide the speed of / at manufacturing facility.

Takt time is the average time between the start of production of one unit and the start of production of the next unit, when these production starts are set to match the rate of customer demand.

$$\text{Takt Time} = \frac{\text{Available Production Time}}{\text{Total Quantity Required}}$$

Here,

Available Production Time is 'total available time for production' – 'planned downtime i.e. spent in shutdown and cleaning' = (480 minutes – 30 minutes) = 450 minutes.

Total Quantity Required is 10 units

$$\text{Takt Time} = \frac{450 \text{ minutes}}{10 \text{ units}} = 45 \text{ Minutes}$$

My explanation about 'Takt Time' :

First of all, this concept is missing in the ICAI module. However, it appeared in this RTP. 'Takt' is derived from a German word. It is the time available to fulfill customer demand. For example – If a Chartered Accountant is devoting 8 hours of his effective time (excluding time losses) for his office work and he has to meet 20 clients in a day; then the average time available per client is

(8 hours x 60 minutes) / 20 clients = 480 minutes / 20 clients = 24 minutes per client

As a student, you have 3 hours to write a 100 marks paper. In such case, the time available per mark is = (3 hours x 60 minutes) / 100 marks = 1.8 minutes per mark.

Interpretation

Customer's demand is 10 units, to calculate the takt time, divide the available production time (in minutes) by the total quantity required. The takt time would be 45 minutes. This means that process must be set up to produce one unit for every 45 minutes throughout the time available. As order volume increases or decreases, takt time may be adjusted so that production and demand are synchronized.

(iii) Advise on Shifting to JIT

To evaluate how much of the old cycle time was spent in inventory, we need to know how organizations assess the efficiency of their manufacturing processes.

One commonly used measure is process cycle efficiency and to calculate the same every process is breakdown into combination of activities such as value added activities, non-value added activities and non-value added activities but strategic activities. In order to generate highest value to customer, only value added activities are included in process. But those non-value added activities, which are strategic in nature, also need to be part of process. Therefore, it may be possible that entire process is not efficient.

To measure efficiency of process, managers keep track of the relation between 'times taken by value added activities' in comparison 'total cycle time'. Such relation/ratio is processing cycle efficiency.

$$\text{Process Cycle Efficiency} = \frac{\text{Value Added Time}}{\text{Cycle Time}}$$

Processing time is considered as value added time; whereas time spend on inspection, storage and moving is non-value added time and included in cycle time. The higher the percentage, less the time (and costs) needs to be spent on non- value added activities such as moving and storing etc.

Computation of Processing Cycle Efficiency

Sr. No.	Activity Category	Traditional System (Actual)	JIT System (Estimated)
A.	Inspection	40	30
B.	Storage	80	20
C.	Moving	20	10
D.	Processing	60	40
E.	Value Added Time ...(D)	60	40
F.	Cycle Time ...(A)+(B)+(C)+(D)	200	100
G.	Process Cycle Efficiency (E)/(F)×100	30%	40%

Of the 200 minutes required for manufacturing cycle under PM2W's traditional system, only 60 minutes were spent on actual processing. The other 140 minutes were spent on non-value added activities, such as inspection, storage, and moving.

The process cycle efficiency formula shows that processing time equaled to 30% of total cycle time. The cycle time is reduced substantially in the JIT system from 200 minutes to 100 minutes. In addition to this, the amount of time that used up in inventory i.e. non-value-added activities is also reduced. Therefore, process cycle efficiency has been increased from 30% to 40%. This significant improvement in efficiency over the previous system comes from the implementation of JIT system.

Therefore, it is advantageous to shift to JIT system.

Question 13 : [MTP – October 2020]

'M' is a leading manufacturing company. Under increasing pressure to reduce costs, to contain inventory and to improve service, M's Costing Department has recently undertaken a decision to implement a JIT system.

The management of 'M' is convinced of the benefits of their changes. But Supplies Manager Mr. Bee fears with the Costing Department's decision.

He said : "We've been driven by suppliers for years .... they would insist that we could only purchase in thousands, that we would have to wait weeks, or that they would only deliver on Mondays !"

Required :

Is Mr. Bee's view point correct? Comment. (5 Marks)

Solution 13 :

JIT Inventory System

For successful operation of JIT inventory system, the suppliers chosen must be willing to make frequent deliveries in small lots. Rather than deliver a week's or a month's material at one time, suppliers must be willing to make deliveries several times a day and in the exact quantities specified by the buyer.

It is described in the problem that suppliers are not willing to make frequent deliveries and make supplies in the exact quantities as required.

Accordingly, Mr Bee's doubt is correct on successful implementation of JIT system.

Question 14 : [RTP - May 2021]

X sells 'mu-50' to its customers. It purchases mu-50 from Y @ ₹ 140 per unit. Y pays all freight to X. No incoming inspection is necessary because Y has a superb reputation for delivery of quality merchandise. Annual demand of X is 13,000 units. X requires 15% annual ROI. The purchase order lead time is 2 weeks.

The purchase order is passed through EDI and it costs ₹ 2 per order. The relevant insurance, material handling etc. is ₹ 3.10 per unit year. X has to decide whether or not to shift to JIT purchasing.

Y agrees to deliver 100 units of mu-50 for 130 times per year (i.e. 5 times in every two weeks) instead of existing delivery system of 1,000 units for 13 times a year, with additional amount of ₹ 0.02 per unit. X incurs no stock out under its current purchasing policy. It is estimated that X will incur stock out cost on 50 units under a JIT purchasing policy. In the event of a stock out, X has to rush order which costs ₹ 4 per unit.

Required :

Briefly COMMENT whether X should implement JIT purchasing system.

Answer 14 :

Comparative 'Statement of Cost' for Purchasing from Y under 'Current Policy' & 'JIT'

Particulars	Current Policy (₹)	JIT (₹)
Purchasing Cost p.a.	18,20,000 (13,000 units x ₹ 140)	18,20,260 (13,000 units x ₹ 140.02)
Ordering Cost	26 (₹ 2 x 13 Orders)	260 (₹ 2 x 130 Orders)
Opportunity / Carrying Cost (Av. inventory x c.c.p.u.p.a.)	10,500 (1/2 x 1,000 units x ₹ 140 x 15%)	1,050 (1/2 x 100 units x ₹ 140.02 x 15%)
Other Carrying Cost i.e. Insurance, Material Handling etc.	1,550 (1/2 x 1,000 units x ₹ 3.10)	155 (1/2 x 100 units x ₹ 3.10)
Stock Out Cost	---	200 (50 units x ₹ 4.00)
Total Relevant Cost	**18,32,076**	**18,21,925**

Comments :

As may be seen from above, the total relevant cost under JIT purchasing policy is lower than the cost incurred under the existing system. Hence, a JIT purchasing policy should be adopted by the company.

Question 15 : [RTP - May 2021]

IPL is a leading manufacturing company. Under increasing pressure to reduce cost, to control inventory level and to improve services, IPL's Costing Department has recently undertaken a decision to implement a JIT system.

The management of IPL is convinced of the benefits of their changes. But Supplies Manager "W" has fears with the Costing Department's decision. He said : "We've been driven by suppliers for years...they would insist that we could only purchase in thousands, that we would have to wait weeks, or that they would only deliver on Mondays !"

Required : COMMENT on Mr. W's viewpoint.

Answer 15 :

"For successful operation of JIT inventory system, the suppliers chosen must be willing to make frequent deliveries in small lots. Rather than deliver a week's or a month's material at one time. Suppliers must be willing to make deliveries several times a day and in the exact quantities specified by the buyer."

It is described in the problem that suppliers are not willing to

- make frequent deliveries and
- make supplies in the exact quantities as required.

Accordingly Mr. W's doubt is correct on successful implementation of JIT system.

* * * * *

4 COST MANAGEMENT TECHNIQUES

Target Costing

Question 1 :

A company is planning a new product. Market research information suggests that 40,000 units of the product can be sold at a maximum of ₹ 25 per unit. The company seeks as minimum mark–up of 25% on Product Cost. It is estimated that the lifetime costs of the product will be as follows:

- Research and Development, Design Costs ₹ 1,50,000
- Manufacturing Costs ₹ 16 per unit
- End of Life Costs ₹ 70,000
- Promotion and Capacity Costs ₹ 20,000

Should the product be manufactured?

Answer 1 :

Statement showing calculation of Target Selling Price per unit :

Particulars	₹
(a) Research, Development & Design cost	1,50,000
(b) Manufacturing cost [40,000 units x ₹ 16 p.u.]	6,40,000
(c) End of life cost	70,000
(d) Promotion and capacity cost	20,000
(e) Total cost [a to d]	8,80,000
(f) Mark up [25% x 8,80,000]	2,20,000
(g) Target sales revenue	11,00,000
(h) Target sales price per unit [f / 40,000]	27.50

Decision : As the maximum sales price is below the target sales price, it is not advisable to manufacture the product.

Question 2 :

UK Ltd. prepared a draft budget for the next year as follows :

Quantity	10,000 units
Selling price per unit	₹ 60
Variable Cost Per Unit :	
- Direct Material	₹ 16
- Direct Labour (2 hours x ₹ 6)	₹ 12
- Variable OH (2 hours x ₹ 1)	₹ 2
Contribution per unit	₹ 30
Total Budgeted Contribution	₹ 3,00,000
Total Budgeted fixed overheads	₹ 2,80,000
Total Budgeted Profit	₹ 20,000

The board of directors are not satisfied with this draft budget and suggested the following changes for the better profit :

(i) The budgeted profit should be ₹ 50,000

(ii) The company should spend ₹ 57,000 on advertisement and the target sales price up to ₹ 64 per unit.

(iii) It is expected that the sales volume will also rise inspite of the price rise, to 12,000 units.

In order to achieve the extra production capacity, however, the work force must be able to reduce the time taken to make each unit of the product. It is proposed to offer a pay and productivity deal in which the wages are per hour is increased to ₹ 8. The hourly rate for variable overheads will be unaffected.

You are required to calculate the target labour time required to achieve the target profit.

Answer 2 :

Statement showing calculation of Labour time required to achieve the target profit :

Particulars	₹
(a) Target sales revenue (12,000 units x ₹ 64)	7,68,000
(b) Target profit (given)	50,000
(c) Targeted total cost [a – b]	7,18,000
(d) Budgeted fixed overheads	2,80,000
(e) Extra cost of advertisement	57,000
(f) Targeted total variable cost [c – d – e]	3,81,000
(g) Direct Material cost [12,000 units x ₹ 16]	1,92,000
(h) Balance Labour & Variable OH cost [f – g]	1,89,000
(i) Labour & Variable OH rate per hour [8 + 1]	9
(j) Targeted Labour Hours [h / i]	21,000
(k) Target labour time per unit [21,000 hours / 12,000 units]	1.75

Question 3 :

Computo Ltd. manufactures two parts 'P' and 'Q' for Computer Industry.

P : annual production and sales of 1,00,000 units at a selling price of Rs. 100.05 per unit

Q : annual production and sales of 50,000 units at a selling price of Rs. 150 per unit.

Direct and Indirect costs incurred on these two parts are as follows:

			(Rs. in thousand)
Particulars	**P**	**Q**	**Total**
Direct Material cost (variable)	4,200	3,000	7,200
Labour Cost (Variable)	1,500	1,000	2,500
Direct Machining cost (See Note)*	700	550	1,250
Indirect Costs:			
Machine set up cost			462
Testing Cost			2,375
Engineering cost			2,250
			16,037

Note: Direct machining costs represent the cost of machine capacity dedicated to the production of each product. These costs are fixed and are not expected to vary over the long-run horizon.

Additional information is as follows:

Particulars	**P**	**Q**
Production Batch Size	1,000 units	500 units
Set up time per batch	30 hours	36 hours
Testing time per unit	5 hours	9 hours
Engineering cost incurred on each product	8.40 lacs	14.10 lacs

A foreign competitor has introduced product very similar to 'P'. To maintain the company's share and profit, Computo Ltd. has to reduce the price to Rs. 86.25 The company calls for a meeting and comes up with a proposal to change design of product 'P'. The expected effect of new design is as follows :

- Direct Material cost is expected to decrease by Rs. 5 per unit.
- Labour cost is expected to decrease by Rs. 2 per unit.
- Machine time is expected to decrease by 15 minutes; previously it took 3 hours to produce 1 unit of 'P'. The machine will be dedicated to the production of new design.
- Set up time will be 28 hours for each set up.
- Time required for testing each unit will be reduced by 1 hour.
- Engineering cost and batch size will be unchanged

Required:

(a) Company management identifies that cost driver for Machine set-up costs is 'set up hours used in batch setting' and for testing costs is 'testing time'. Engineering costs are assigned to products by special study. Calculate the full cost per unit for 'P' and 'Q' using Activity-based costing.

(b) What is the Mark-up on full cost per unit of P?

(c) What is the Target cost per unit for new design to maintain the same mark up percentage on full cost per unit as it had earlier? Assume cost per unit of cost drivers for the new design remains unchanged.

(d) Will the new design achieve the cost reduction target?

(e) List four possible management actions that the Computo Ltd. should take regarding new design.

Answer 3 :

Working Notes :

Particulars	P	Q
(a) Production/Sales Quantity (units)	1,00,000	50,000
(b) Batch Size (units)	1,000	500
(c) No of batches (a / b)	100	100
(d) Set up time per batch (hours)	30	36
(e) Total set up hours (c x d)	3,000	3,600
(f) Machine set up cost (Rs.)	4,62,000	
(g) Cost driver rate per machine set up hour	4,62,000 / 6,600 = Rs. 70	
(h) Testing time per unit	5 hours	9 hours
(i) Total testing time (a x h) (hours)	5,00,000	4,50,000
(j) Total Testing cost	Rs. 23,75,000	
(k) Cost driver rate per testing hour	23,75,000/9,50,000 = Rs. 2.50	

(a) Computation of full cost per unit using Activity Based Costing :

Particulars	Basis and Calculations	P	Q
Direct material	Direct	42,00,000	30,00,000
Direct labour	Direct	15,00,000	10,00,000
Direct machining cost	Direct	7,00,000	5,50,000
Machine set up cost	3,000 hours @ Rs. 70	2,10,000	
	3,600 hours @ Rs. 70		2,52,000
Testing cost	5,00,000 hours @ Rs. 2.50	12,50,000	
	4,50,000 hours @ Rs. 2.50		11,25,000
Engineering cost	Directly given	8,40,000	14,10,000
Total cost (Rs.)		87,00,000	73,37,000
Cost per unit (Rs)	Total cost / no. of units	87.00	146.74

(b) Mark up on full cost basis for product P :

Particulars	Per unit
Selling price	100.05
Less: Full cost	87.00
Mark up	13.05
Percentage of mark up on full cost (13.05 / 87.00) x 100	15%

(c) Target cost of Product P :

	Rs.
Target price (given as competitor's price)	86.25
Less : Mark-up (86.25 x 15 / 115)	11.25
Target cost per unit (Rs.)	75.00

(d) Statement of cost for new design of 'P' :

Particulars	Calculations	Cost per unit
Previous total cost p.u.	W. N. (a)	87.00
Less : Savings in cost :		
Direct Material	Decreased by Rs. 5 p.u.	5.00
Direct Labour	Decreased by Rs. 2 p.u.	2.00
Direct Machining cost	No saving as machine is dedicated	0
Machine set up cost	2 hours x Rs. 70 / 1000 units	0.14
Testing cost	1 hour x Rs 2.5	2.50
Engineering cost	No change, no savings	0
Net cost	Total cost - savings	77.36

The target cost is Rs. 75 p.u. and estimated cost of new design is Rs. 77.36 p.u. Thus, the new design does not achieve the target cost set by Computo Ltd. Hence the target mark up shall not be achieved.

(e) Possible Management Action :

- Value engineering and value analysis to reduce the direct material costs.
- Time and motion study in order to redefine the direct labour time and related costs.
- Exploring possibility of cost reduction in direct machining cost by using appropriate techniques.
- Identification of non-value added activities and eliminating them in order to reduce overheads.
- The expected selling price based on estimated cost of Rs. 77.36 per unit is (Rs. 77.36 + 15%) Rs. 88.96. Introduce sensitivity analysis after implementation of new design to study the sales quantity changes in the price range of Rs. 86.25 to Rs. 88.96

Question 4 :

Kowloon Toy Company (KTC) expects to successfully launch Toy "H" based on a Disney character. KTC must may 15% royalty on the selling price to the Disneyland. KTC targets a selling price of ₹100 per toy and profit of 25% on selling price.

The following are the cost data forecast:

Particulars	₹/ toy
Component H_1	8.50
Component H_2	7.00
Labour: 0.40 hr. @ ₹ 60 per hr.	24.00
Product Specific Overheads	13.50

In addition, each toy requires 0.6 kg of other materials, which are supplied at a cost of ₹16 per kg. with a normal loss of 4%, due to substandard quality.

Required :

DETERMINE if the above cost structure is within the target cost. If not, what should be the extent of cost reduction?

Answer 4 :

Target Cost "H"

Particulars	₹ / Toy
Target Selling Price	100.00
Less: Royalty @15% of sales	15.00
Less: Profit @ 25% of sales	25.00
Target Cost	60.00

Actual Cost Structure of "H" :

Particulars	₹ / Toy
Component H_1	8.50
Component H_2	7.00
Labour (0.40 hr. × ₹ 60 per hr.)	24.00
Product Specific Overheads	13.50
Other Material (0.6 kg / 96% × ₹16)	10.00
Total Cost of Manufacturing	63.00

Conclusion : Total Cost of Manufacturing is ₹ 63 per toy, while Target Cost is ₹ 60. Company KTC should make efforts to reduce its manufacturing cost by ₹ 3 to achieve the target.

Question 5 : [Case Scenario – ICAI Module]

Kaveri Ltd. (KL) is a manufacturer of bikes in India and it sells them in India and outside India. KL has just launched the World's smallest and most affordable bike called 'Zingaroo'. The bike is mounted with all-aluminum, single cylinder, air cooled, 99.2 cc engine. The engine makes just over 8 bhp power and 8 Nm in torque, but it stakes claim to be the fuel-efficient bike, with a claimed figure of 88 kmpl. It has been creating competition for two wheelers as none of the Indian companies as well as foreign companies, offer a bike for such a competitive price within the reach of middle class family.

KL has adopted target costing technique in manufacturing this bike. For KL, maintaining target price was difficult. During the designing and production process of bike, inputs costs increased frequently. However, KL designed various components especially for bike to maintain the target price. Though, one curiosity prevails, how this can be done in the future when input costs are bound to increase further.

Many environmentalists have opposed the manufacture of this bike, because they believe that mass production of small bike (about 2.5 lakh bikes every year) will create heavy pollution. Many people believe that this small bike is not up to the safety standards due to lightweight and use of aluminum and plastic frames. The design of this bike is entirely different from that of other bikes. This also causes a doubt that the existing bike mechanics would be able to repair or not.

Durability of bike is another issue in the Indian environment. Further, performance of 'Zingaroo' more or less depends upon the condition of roads and traffic system.

After the launch of 'Zingaroo', many other national and international automobile companies are also planning to manufacture small bike which will create tough competition in near future.

Required :

Now you being a strategic performance analyst of KL, answer the following questions :

(i) IDENTIFY strategy which KL has adopted for 'Zingaroo' bike?

(ii) After adopting target costing, IDENTIFY issues and challenges faced by KL and suggest the remedial action to be taken to solve these issues?

Answer 5 :

i) KL has adopted Low Cost Strategy for `Zingaroo' bike since the main purpose of manufacturing this bike was to make it cheapest and affordable.

ii) The issues and challenges faced by KL and their remedial action are as follows :

Maintaining of Target Price :
'Zingaroo' bike is one of the world's cheapest and smallest bike. Maintaining target-price proved to be a big challenge for the KL since input cost of bike are bound to increase further in future. The initial value engineering may not uncover all possible cost savings. Thus, Kaizen Costing may be designed to repeat many of the value engineering steps for as long as a bike is produced, constantly refining the process and thereby stripping out extra costs.

Environmental Issues :
Many Environmentalists have opposed the manufacture of bike as they believe that mass production of small bikes will create heavy pollution since automobile pollution is already a big problem for a country like India. For this issue, 'Zingaroo' bike can be prepared based on BS emission norms. These norms restrict the pollution created by any motor vehicle.

Safety Issues :
Since 'Zingaroo' bike is made of aluminium and plastic frames so this may also create safety issues for the customers. For such issues, KL should meet safety standards. Further, KL should make people aware that 'Safety is Primary' or ' Drive Safely'.

Servicing / Repairing Facilities :
The design of 'Zingaroo' bike is entirely different from that of other bikes. This causes a doubt that the existing bike mechanics would be able to repair or not. For such problem, creation of a good network of service center can be a solution i.e. repair centre should be established at required places.

Durability :
Durability of 'Zingaroo' bike is another issue in the Indian environment. The performance of bike more or less depends upon the condition of roads and traffic system. For such issues, tyre quality and hydraulic brake system should be compatible to the roads and traffic system.

Global Competition :
After the launch of 'Zingaroo' many other national and international automobile companies are also planning to manufacture a small bike, which will be a big challenge for the KL in the near future. To face such competition, it may adopt Kaizen Costing technique. The cost reductions resulting from Kaizen Costing are much smaller than those achieved with Value Engineering but are still worth the effort since competitive pressures are likely to force down the price of 'Zingaroo' over time, and any possible cost savings allow KL to still attain its targeted profit margins while continuing to reduce cost.

Value Analysis and Value Engineering

Question 6 : Case Scenario [ICAI Website]

Queenstown Wood Co. (QWC) began 20 years ago, as a small family-run business supplying custom-made school furniture. Now QWC has grown into a thriving hub of experts specializing in either custom-made, locally sourced or quality imported commercial grade furniture. The newly appointed CFO is concerned about the trends in dropping sales volumes, increasing costs, and hence falling profits over the last three years. He observed that the reason for this is the increased cut-throat competition that has emerged over the last three years. For many years, QWC has been known for high quality but now this quality is being matched by the competitors. QWC's share of the market is declining due to equivalent products being sold by competitors at lower prices. It is considered that, to offer such low prices, the furniture's production costs of the competitors must be lower than QWC's.

Required :

ADVISE how QWC can improve its sales volumes, costs and profits using Value Analysis and Functional Analysis.

Solution 6 :

Value Analysis is viewed as a reduction in cost and problem solving technique. Such technique analyses an existing product to identify and cutback or eliminate any cost which do not give any contribution to performance or value. It is a planned, scientific approach to cost reduction which reviews the material composition of a product and production design so that modifications and improvements can be made without affecting value of the product to the customer or to the user.

Functional analysis is applied to the design of new products and breaks the product down into functional parts. For example, a new chair may have the moveable feature. The value that the customer places on each feature is considered and added to give a target cost. Thus, functional analysis aims to increase profits by reducing costs through elimination of unnecessary features and/or by adding cost-effective new features that are so attractive to customers that the product becomes more lucrative.

The result of the above analysis is to improve the value of the furniture while maintaining costs and/or cutback the costs of the furniture without compromising with value. It is clear from the scenario that QWC needs to cut back its selling prices to compete in the market. This selling price reduction can only be possible by a reduction in QWC's unit costs. However, such reduction must not be accomplished by compromising with quality. Both value analysis and functional cost analysis may be used for QWC; however, value analysis is likely to be a more useful technique because office tables and chairs are such items which are demanded more on the basis of their use value rather than their esteem value.

Product Life Cycle Costing (PLC)

Question 7 : [RTP - May 2018]

Case Scenario

Swift Tech Ltd. (STL) is a leading IT security solutions and ISO 9001 certified company. The solutions are well integrated systems that simplify IT security management across the length and depth of devices and on multiple platforms. STL has recently developed an Antivirus Software and company expects to have life cycle of less than one year. It was decided that it would be appropriate to adopt a market skimming pricing policy for the launch of the product. This Software is currently in the Introduction stage of its life cycle and is generating significant unit profits.

Required :

(i) EXPLAIN, with reasons, the changes, if any, to the unit selling price that could occur when the Software moves from the Introduction stage to Growth stage of its life cycle.

(ii) Also IDENTIFY necessary strategies at this stage.

Solution 7 :

(i) Reasons for changes in selling price :

(a) When a product moves from introduction phase to growth phase, we see the first sign of competition in the market. The success of our product and higher profit margin per unit attracts competitors to enter the market. To keep a control on this competition, we may have to reduce the unit selling price.

(b) Under skimming pricing policy, we charge higher selling price initially to recover the cost of research & development and high sales promotion expenses. However, gradually the sales price is reduced to attract the price sensitive customers.

(c) Reduction in sales price will increase the sales volume and thus the total profit will increase. Though there would be a reduction in profit per unit. However, growth in sales volume will offset such reduction in profit per unit.

(ii) Strategies at this stage may include the following :

(a) Improving quality and adding new features such as Data Theft Protection, Parental Control, Web Protection, Improved Scan Engine, Anti Spyware, Anti Malware etc.

(b) Sourcing new market segments / distribution channels to increase volume.

(c) Changing marketing strategy to increase demand.

(d) Lowering price to attract price-sensitive buyers.

Question 8 : [Case Scenario – ICAI Module]

Netcom Ltd. manufactures and sells a number of products. All of its products have a life cycle of less than one year. Netcom Ltd. uses a four stage life cycle model (Introduction, Growth, Maturity and Decline).

Netcom Ltd. has recently developed an innovative product. It was decided that it would be appropriate to adopt a market skimming pricing policy for the launch of the product.

However, Netcom Ltd. expects that other companies will try to join the market very soon.

This product is currently in the introduction stage of its life cycle and is generating significant unit profits. However, there are concerns that these current unit profits will not continue during the other stages of the product's life cycle.

Required :

Explain, with reasons, the changes, if any, to the unit selling price and the unit production cost that could occur when the products move from the previous stage into each of the following stages of its life cycle :

(i) Growth

(ii) Maturity

Answer 8 :

(i) Growth Stage :

Compared to the introduction stage the likely changes are as follows :

Unit Selling Prices :

These are likely to be reducing for a number of reasons :

- The product will become less unique as competitors use reverse engineering to introduce their versions of the product.
- Netcom may wish to discourage competitors from entering the market by lowering the price and thereby lowering the unit profitability.
- The price needs to be lowered so that the product becomes attractive to different market segments thus increasing demand to achieve the growth in sales volume.

Unit Production Costs :

These are likely to reduce for a number of reasons :

- Direct materials are being bought in larger quantities and therefore Netcom may be able to negotiate better prices from its suppliers thus causing unit material costs to reduce.
- Direct labour costs may be reducing if the product is labour intensive due to the effects of the learning and experience curves.
- Other variable overheads costs may be reducing as larger batch sizes reduce the costs of each unit.
- Fixed production costs are being shared by a greater number of units.

(ii) Maturity Stage :

Compared to the growth stage the likely changes are as follows :

Unit Selling Prices :

These are unlikely to be reducing any longer as the product has become established in the market place. This is a time for consolidation and whilst there may be occasional offers to tempt customers to buy the product the selling price is likely to be fairly constant during the period.

Unit production Costs :

Direct material costs are likely to be fairly constant in this phase and may even rise as the quantities required diminish compared to those required in the growth stage with the consequential loss of negotiating power.

Direct labour costs are unlikely to be reducing any longer as the effects of the learning and experience curves have ended. Indeed the workers may have started working on the next product so that their attention towards this product has diminished with the result that these costs may increases.

Overhead costs are likely to be similar to those of the end of the growth phase as optimum batch sizes have been established and are more likely to be used in this maturity stage of the product life cycle where demand is more easily predicted.

Question 9 : [RTP – Nov. 2019]

Mould & Dies (M&D) was established in 1980 and has enormous wealth of experience in the mould manufacturing industry and serves wide range of plastic moulds all over nation. Over the past decade, M&D has developed the reputation for quality products & services for customer focused approach. It deals in injection moulds, blow moulds, die sets, moulds base etc.

With a state-of-the-art infrastructure facility, M&D is able to meet the qualitative and quantitative demands of its clients. Its vision & mission is to provide high class manufactured products by using best quality raw materials.

M&D has developed a new product "M" which is about to be launched into the market and anticipates to sell 80,000 of these units at a sales price of ₹ 300 over the product's life cycle of four years. Data pertaining to product "M" are as follows :

Costs of Design and Development of Moulds, Dies, and Other Tools	₹ 8,25,000
Manufacturing Costs	₹ 125 per unit
Selling Costs	₹ 12,500 per year + ₹ 100 per unit
Administration Costs	₹ 50,000 per year
Warranty Expenses	5 Replacement Parts per 25 units at ₹ 10 per part; 1 Visit per 500 units (cost ₹ 500 per visit)

Required :

(i) COMPUTE the product M's 'Life Cycle Cost'.

(ii) SUGGEST two ways to maximize M's lifecycle return.

Note : Ignore time value of money

Answer 9 :

(i) Statement Showing M's Life Cycle Cost (for 80,000 units) :

Particulars	Amount (₹)
Costs of Design and Development of Moulds, Dies, and Other Tools	8,25,000
Manufacturing Costs (₹ 125 x 80,000 units)	1,00,00,000
Selling Costs [(₹12,500 p.a. x 4 years) + (₹ 100 p.u. x 80,000 units)]	80,50,000
Administration Costs (₹ 50,000 p.a. x 4 years)	2,00,000
Warranty Expenses : (80,000 units / 25 units x 5 parts x ₹ 10 per part) (80,000 units / 500 units x 1 visit x ₹ 500 per visit)	 1,60,000 80,000
Total Life Cycle Cost	1,93,15,000

(ii) **Following ways may be suggested to maximize M's lifecycle return :**

R&D Costs

Often a significant part of the cost is incurred at R&D phase of new product, hence M&D should carefully plan and design its new product "M" as it will determine the number of parts, production process to be used etc. M&D can apply **value engineering** here. It involves improving product quality, reducing product costs, fostering innovation, eliminating unnecessary and costly design elements, ensuring efficient investment in product, and developing implementation procedures. Value engineering is most successful when it is performed early in product development stage. A value engineering study should be performed within the first 25-30% of the design effort prior to selecting the final design alternative. Here, it is also important that R&D team should work as a part of cross functional team i.e. (participation in a group of people from different functional areas), to minimise lifecycle cost and the production cycle time in new development.

Speed up the Product Launch

In cut throat competitions, it is important for M&D to get new product "M" launched into the market as soon as possible, since this will give "M" a **long stay** in the market place without competition in the market. Competitors will always try to launch a rival product as quickly as possible in order to gain 'competitive edge'. M&D may lose overall profitability if it delays in launching of Product "M". It is usually worthwhile incurring extra costs to keep the launch on schedule or to speed up the launch.

Environmental Management Accounting (EMA)

Question 10 : Case Study [ICAI Module]

Shandaar Bangles Ltd. (SBL) have been recognized as a manufacturers and exporters of high quality Bangles, designed and manufactured using optimum quality raw material, sourced from trustworthy vendors of the market.

Manufacturing Process

The process of manufacture of glass bangles is highly skilled and labour oriented. It comprises of the following main operations:

1. Glass Melting Phase
2. Parison Making Phase
3. Spiral/Coil Forming Phase

Student Note : To understand the above processes, you may go to You Tube. Type "How beautiful glass bangles are made? You will find a video of around 1:30 minutes. Please watch it first and then proceed further.

In first phase, raw materials like sand, soda ash, lime stone feldspar, borax etc. with other additives and colouring materials in a suitable proportion are mixed manually and fed into the pot furnace. The raw material is melted in the furnace at a temperature of about 1300 – 1400 (°C) to obtain molten glass.

In second phase, molten glass is drawn from the pot of the furnace with the help of the iron pipe and formed into gob to gather required quantity of glass for formation into parisons on iron plates. The parisons of different colours are joined together and reheated in an auxiliary furnace to obtain required designs.

In third phase, the reheated parison is then transferred to 'Belan Furnace' from which the glass is further drawn into spiral / coil of bangles on the spindle counted and rotated manually at uniform rate. Spiral are then taken out from the spindle and cut with the help of a pencil cutter to separate out the single pieces of bangles from spiral. These cut or un-joined bangles are then sent for joining of end, finishing cutting & polishing, decoration etc. The finished products are then neatly packed for sale.

Environmental Impact

But unfortunately, these processes have environmental impact at all stages of the process, including emissions of airborne pollution in the form of ashes, gases, noise and vibration.

Conditions of the Workplace

Due to the need for maintaining appropriate temperature for melting and moulding of the glass, furnaces are kept burning. Therefore, workers have to work with such working conditions continuously without proper leisure time.

The above-mentioned factors become more harmful while working in immense heat and sound which is normally higher than permissible levels.

Health Impact

A recent study has revealed adverse impact of pollution over workers and people who are living in nearby area.

Management Initiatives

The management of company is worried about environmental impact and health impact and has taken certain initiatives in taking care of environment like - batch house cyclonic dust collector, noise absorbing device, natural gas fired furnace, better refractory materials, training for waste minimization, treatment of solid waste, research and development activities aimed at reducing pollution level, planting trees, treatment of nitrogen oxide and other harmful gases.

Required :

Management desires to adopt environmental management accounting as a part of strategic decision making process.

(i) EXPLAIN the requirement to have environmental management accounting and IDENTIFY the SBL's environmental prevention, appraisal, and failure costs.

(ii) ANALYZE the appropriateness of SBL incorporating the following in implementing Environmental Management Accounting:

- Activity Based Costing
- Life Cycle Costing
- Input Output Analysis

(iii) EXPLAIN the need of non-financial consideration in decision making and suggest safety measures that can be taken into consideration for workers.

Solution 10 :

Environmental management accounting (EMA) is the generation and analysis of both financial and non-financial information in order to support internal environmental management processes i.e. identification, prioritization, quantification and recording of environmental cost into business decision.

By adopting EMA, SBL will have following benefits:

- Product Pricing.
- Budgeting.
- Investment Appraisal.
- Calculating Investing Options.
- Designing, Calculating Costs, Savings and Benefits of Environment Projects.
- Setting Quantified Performance Targets.
- Assessment of Annual Environmental Costs.
- Environmental Performance Evaluation, Indicators and Benchmarking.
- External Reporting of Environmental Expenditures, Investments and Liabilities.

(i) Environmental Costs of SBL

- Environmental Prevention Cost: These costs are basically incurred in relation to activities undertaken to prevent the production of waste that could harm the environment.

  Company's efforts to minimize the effect of its activities on the environment like installing batch house cyclonic dust collector, natural gas fired furnace, better refractory materials, training for waste minimization, research and development activities, noise absorbing device and planting trees can be classified as Environmental Preventive Cost.

- Environmental Appraisal Costs: It means costs incurred in relation to activities undertaken to determine whether products, processes and other activities within firm are complying with environment standards.

  SBL may perform 'Contamination Test' to observe the environment compatibility of its processes and can be categorized under environmental appraisal cost.

- Environmental Failure Cost: It means cost incurred in relation to activities dealing with pollution arising from the activities of entity and includes costs related to treatment of harmful gases and treatment of solid waste.

(ii) Appropriateness of Techniques for Identification and Allocation

Activity Based Costing

This costing technique would help the SBL to separate environmental costs from the general overheads and allocate them to glass bangles by identifying appropriate drivers of these environmental costs. Possible environment activities for environmental costs and their drivers are:

Activity	Cost Drivers
• Planting of trees	• Number of trees planted
• Treatment of nitrogen oxide and other harmful gases	• Volume of nitrogen oxide treated

• Solid waste removal	• Volume of such waste
• Research and development activities	• Man hours worked for such activities

Life Cycle Costing

By using this costing in EMA, SBL would be able to identify, record and control the environmental costs relating to various stages in the life of glass bangles. At each of following stage environmental cost would be incurred :

- In raw material stage, some natural product would be purchased.
- In manufacturing stage, emission and treatment of nitrogen oxide & other gases and treatment of solid waste.
- In marketing and distribution stage, environmental cost relating to transportation of glass bangles to various customers.

Input /Output Analysis

Here detailed analysis of input and output of a system is done for the purpose of assessment of ecological well being of entity's products, processes and other activities. This technique is based on the fact that whatever goes into the system has to come out of it.

In case of SBL, it can evaluate the volume of sand, soda ash, lime stone feldspar, borax etc. and the resulting volume of output i.e. glass bangles. Through such evaluation, the SBL would be able to allocate and analyse environmental cost attributable to input and output of glass bangles.

(iii) Non-Financial Considerations

Entities generally give emphasis on financial measures such as earnings and accounting returns but little emphasis on qualitative aspects, such as customer and employee satisfaction, innovation and quality. Due to which mostly companies could not continue in long term. So for the purpose of achieving long-term organizational strategies, non-financial consideration should be taken into account. Without this it may be that company achieve short term goal but would be difficult to achieve long term goal.

In SBL, it can be clearly seen that there is great impact on health of workers. By creating a safe and healthy environment for employees, SBL can improve productivity, business performance, staff morale and employee engagement. Further, SBL will also be able to reduce – accidents, work related ill health, sick pay costs, as well as insurance costs. A healthy workforce can demonstrate corporate responsibility.

If SBL looks after employees, business is likely to have a more positive public image.

To create safe and healthy environment following measures can be taken into consideration:

- Safety monitoring system
- Workers must be trained.
- Recruitment of more workers.
- First aid kit should be available.
- Protective glasses, clothes, gloves should be provided.
- Regular health check-up camps and awareness programs should be undertaken.

Question 11 : Case Scenario [ICAI Module]

CNB Oil Ltd., an Indian oil company, is the leading manufacturer of all streams of oil and engaged in refining (processing capacity 50 MMTPA of crude oil), pipeline transportation and marketing of petroleum products, research & development, exploration & production, marketing of natural gas and petrochemicals. The company has high-caliber employees, sophisticated technologies and leading-edge R&D.

By venturing itself into the renewable and the nuclear energy, CNB has grown and evolved itself from a pure petroleum refining and marketing company to a full-fledged energy company. Due to government's new environmental policy, environmental report is mandatorily required to be submitted yearly for the prescribed industries polluting environment substantially otherwise would be penalized. Energy sector also falls in these prescribed industries.

CNB has already taken initiatives to control air pollution and water pollution like use of low sulphur fuel oil in boilers and heaters & NOx burners to minimize gas emission, network of underground sewers for segregated collection of various wastewater streams for waste water management etc. However while preparing and analyzing environmental report, Mr. K V Sharma, CEO, is not happy with high environmental cost in terms of Waste (oily / chemical / biological sludge, scrap batteries, e-waste, chemical containers, effluents etc.), Raw Material Consumption, Water Consumption, Energy and Transportation. He raised his concern with Board of Directors and they have decided to appoint you as an environmental management accounting expert to manage environmental cost.

Required :

APPLY Environmental Management Accounting in CNB to manage environmental costs.

Solution 11 :

Environmental Management Accounting (EMA) is the process of collection and analysis of the information relating to environmental cost for internal decision making. EMA identifies and estimates the cost of environment related activities and seek to control theses cost.

In CNB, during refinery operations, waste water, fugitive emissions, flue gases and solid wastes are generated. Due to this excess waste and gas emission, environmental cost rises. Scarce natural resources should be used in such a way so that their consumption is sustainably optimized. In order to cutback environmental cost, EMA can be applied as follows:

Waste

CNB should measure, manage and monitor waste from operations in order to minimise impact on people and the environment. 'Mass balance' approach can be used to determine how much material is wasted in production, whereby the weight of materials bought is compared to the product yield. From this process, potential cost savings may be identified.

In CNB, wastes are oily / chemical / biological sludge, scrap batteries, e–waste, chemical containers, effluent etc. Waste generated in operations is either treated within the premises or disposed through approved waste treatment, storage, and disposal facility. To avoid the usage of chemical drums/ containers in large quantity, separate storage tanks can be created for bulk storage of additives to reduce the drum procurement and disposal.

Further, refineries in operation should be upgraded from time to time to minimize waste.

Water Management

Businesses pay for water twice – first, to buy it and second, to dispose it off. If savings are to be made in terms of reduced water bills, it is important for CNB to identify where water is used and how consumption can be decreased.

For water conservation, sustainable water management techniques should be adopted. In refining operation, water is mainly used in boilers and cooling units. Collective efforts should be made to optimize water consumption and maximum reuse of used water. Advanced treatment systems like rain water harvesting, ultra-filtration, reverse osmosis etc. may be used for water purification for further use. This would lead to substantial reduction in intake of fresh water.

In addition, CNB staff should be alerted for water conservation through seminars, presentations, conferences and awareness campaigns.

Energy

Often, energy costs can be reduced significantly at very little cost. Environmental Management Accounts may help to identify inefficiencies and wasteful practices and, therefore, opportunities for cost savings. Some of energy conservation initiatives may be taken by CNB like:

- Conducting periodic energy audits for identifying energy saving opportunities.
- Phasing out conventional lights and replacement with LED lights.
- Power factor improvement by installation of capacitor banks.
- Installation of 5 star rated energy equipment.
- Prevention of idle running of equipment.
- Installation of solar lights.
- Use of nano molecular thermal additives in ACs.
- Installation of efficient energy monitoring system for energy intensive equipment.
- Capacity improvement for batteries.

Consumables and Raw Material

Refineries 'refine' crude oil in massive quantities, to produce the fuels need. There should be a continuous monitoring on optimum utilization of crude oil to improve gross refining margin. The gross refining margin is the difference between the total value of petroleum products coming out of an oil refinery (output) and the price of the raw material (input) which is crude oil. Not only crude oil, but there should also be optimum and sustainable utilization of other input resources like additives, chemicals etc. from procurement to production stages.

CNB may use recyclable technology for raw material and consumable wastages which provides sustainability in terms of environmental protection and reduction in carbon footprint. Periodic testing should be performed to assess the health of equipment and pipelines as to have better process of raw materials and consumables.

Transport

Again, EMA may be used to identify saving in terms of transport of goods and materials. At CNB, in order to cutback emission and fuel consumption due to transportation, route optimization activity may be used like allocation of customer on the basis of nearest depots and locations as to reduce distance, real time fleet tracking using GPS (to make sure that vehicles do not deviate from assigned shortest route) etc.

Accordingly, by adopting above mentioned measures of EMA, environmental cost may be cutback and efficiency of working of CNB may be enhanced.

Question 12 : [MTP – October, 2019]

Following three independent situations pertaining to environmental management and sustainability are provided to you :

Situation I

Wasco Limited is a chemical company which uses chloro-fluorocarbons (CFC) in the production of chemical. As awareness of the environmental damage caused by CFC spread, Wasco Limited stopped using CFC in its production processes and analysed and redesigned its product range much before the legislation controlling use of CFC introduced by the Government.

Situation II

Energy drink manufacturer Cool Limited was ordered to submit a yearly report to the Ministry of Environment and Forests on activities, which contains information concerning collection, recovery and recycling of packaging waste, fulfillment of the targets, volume of recovered and recycled packaging waste by type of material and declaration that all compulsory contributions and taxes have been paid.

Situation III

KOA Limited has achieved a 25% reduction of energy consumption through its "Go Renewable" initiative. For the company, a 25% reduction represents a cost saving of about Rs. 30,00,000/-.

Required :

Read the above three situations and EXPLAIN **any 2** from (i), (ii) and (iii) below :

(i) Why Wasco Limited stopped using CFC and redesigned its product range much before legislation introduced by Government? **(5 Marks)**

(ii) The risk exposure of Cool Limited. **(5 Marks)**

(iii) How focusing on environmental sustainability provides opportunity to KOA Limited for reducing costs? **(5 Marks)**

Answer 12 :

(i) Ever increasing and demanding environmental regulation is forcing companies to change their practices. In many countries, numerous pieces of legislation cover areas such as air quality, climate change, hazardous substances, packaging, waste, and water quality.

The trend is very much in the direction of increased and more stringent legislation. Environment sustainability is not an issue that can be avoided by any organisation.

Organisations need to consider how environmental regulation will impact their operations and the cost of doing business.

By stopping the use of CFC much before the legislation, Wasco Limited gained advantages over its rivals. Wasco's actions were integral to its own strategic success, and instrumental in driving through the subsequent legislation from which the company will later get benefited.

(ii) Organizations increasingly have to demonstrate that they are managing all of their risks systematically and responsibly. This includes environmental risks. Risks that are a result of impacts of the organization on the environment. By assessing the environmental risks associated with their activities, processes, product, and services, organizations can identify their potential legal and business exposure. Non-compliances can cause enormous financial impacts, such as fines, penalties, legal costs, and damages.

Thus, Cool Ltd is exposed to environmental risks.

(iii) Focusing on environmental sustainability will often provide opportunities for reducing costs. For example, reducing carbon impacts often also saves energy costs. Similarly, programmes for reducing wastes improve environmental performance and reduce operating costs. KOA Ltd. has already achieved a cost saving of about Rs. 30,00,000 by reducing the energy consumption by 25%.

Reducing environmental impacts can also reduce or eliminate associated taxes, levies, and other compliance costs.

Focusing on environmental sustainability, thereby making investments in developing clean technologies and more energy-efficient products and processes will not only save the organization money, but could also be patented and / or sold to other organizations, providing an additional source of income. KOA Limited may have carbon credit for efficiency in reducing energy and sell on the open market, thereby actually generating revenue.

Pareto Analysis

Question 13 : [May 2019 Exam]

The information given below pertains to ABC Enterprises, a specialized car garage door installation company. ABC Enterprises use to get multiple service calls from the customers with variety of requirements. They may have to Install, Replace, Adjust or Lubricate some part or other to make the door functional. They work with 5 parts as given in the table namely Door, Motor, Track, Trimmer and T-Lock.

S.N.	Parts	Type of Service				Total
		Install	Replace	Adjust	Lube	
1	Door	2	5	1	0	**8**
2	Motor	3	2	16	9	**30**
3	Track	5	0	6	6	**17**
4	Trimmer	14	6	0	0	**20**
5	T-Lock	5	0	1	0	**6**
6	Miscellaneous	0	2	1	1	**4**
	Total	**29**	**15**	**25**	**16**	**85**

Required :

(i) Using the above data, carry out a Pareto Analysis (80/20 rule) of Total Parts. **(3 Marks)**

(ii) Using the same data carry out the second level Pareto Analysis on the type of services with respect to Motors only. **(2 Marks)**

(iii) Give your recommendations on the basis of your calculations in (i) and (ii) above. (Do calculations to two decimals only) **(5 Marks)**

OR

State the business situations in which you recommend to apply Pareto Analysis. **(5 Marks)**

Answer 13 :

(i) Statement Showing "Pareto Analysis of Total Parts"

Parts	No. of Items	% of Total Items	Cumulative %
Motor	30	35.29%	35.29%
Trimmer	20	23.53%	58.82%
Track	17	20.00%	78.82%
Door	8	9.41%	88.23%
T-Lock	6	7.06%	95.29%
Miscellaneous	4	4.71%	100.00%
Total	85	100.00%	

(ii) Statement Showing "Pareto Analysis of Type of Services (for Motor)"

Service Type	No. of Items	% of Total Items	Cumulative %
Adjust	16	53.33%	53.33%
Lube	9	30.00%	83.33%
Install	3	10.00%	93.33%
Replace	2	6.67%	100.00%
Total	30	100.00%	

(iii) Pareto Analysis is a rule that recommends focus on most important aspects of the decision making in order to simplify the process of decision making. The very purpose of this analysis is to direct attention and efforts of management to the product area where best returns can be achieved by taking appropriate actions.

Pareto Analysis is based on the 80/20 rule which implies that 20% of the products account for 80% of the revenue. But this is not the fixed percentage rule. In general business sense, it means that a few of the products, goods or customers may make up most of the value for the firm.

The present case stands in a difference to 80/20 rule. Because the company installs doors, they sometimes have multiple service calls to install each door piece by piece. They may have to install, replace, adjust, or lubricate some part to get the door working properly. They work with five main parts i.e. door, motor, track, trimmer and t-lock. The service calls with reference to motors are heavy and accounted for as much as 35.29% of the number of calls attended. Motor together with trimmer accounted for 58.82%. So, these two parts are to be considered as key parts and ABC enterprises must be ever ready to cater to all provisional requirements for attending these classes without any inordinate delay. Any delay in service of these calls is likely to damage its service rendering reputation within a very short span of time. Further, the second level Pareto Analysis on motors has revealed a particular reference to the service problems related to motors. Adjustments and Lubrication issues cover up 83.33% of the total service problems exclusively connected to Motors. So, ABC Enterprise must direct its best efforts and develop specific expertise to solve these problems in the best interest of the customers.

OR

Pareto Analysis is generally applicable in the following business situations.

Pricing of a Product :

- In the case of a firm dealing with multi products, it would not be possible for it to analyse cost-profit-price-volume relationships for all of them. In practice, in case of such firms approximately 20% of products may account for about 80% of total sales revenue. Pareto Analysis is used for analysing the firm's estimated sales revenues from various products and it might indicate that approximately 80% of its total sales revenue is earned from about 20% of its products.

Customer Profitability Analysis :

- Instead of analysing products, customers can be analysed for their relative profitability to the organisation. Again, it is often found that approximately 20% of customers generate 80% of the profit. There will always be some customers who are less profitable than others, just as some products are less profitable than others. Such an analysis is useful tool for evaluation of the portfolio of customer profile and decision making such as whether to continue serving a same customer group, what is the extent of promotion expenses to be incurred.

ABC Analysis – Stock Control :

- Another application of Pareto analysis is in stock control where it may be found that only a few of the goods in stock make up most of the value. In practice, approximately 20% of the total quantity of stock may account for about 80% of its value. The outcome of such analysis is that by concentrating on small proportion of stock items that jointly accounts for 80% of the total value, a firm may will be able to control most of monetary investment in stocks.

Application of Activity Based Costing :

- In Activity Based Costing it is often said that 20% of an organisation cost drivers are responsible for 80% of the total cost. By analysing, monitoring and controlling those cost drivers that cause most cost, a better control and understanding of overheads will be obtained.

Quality Control :

- Pareto analysis seeks to discover from an analysis of defect report or customer complaints which "vital few" causes are responsible for most of the reported problems. Often, 80% of reported problems can usually be traced to 20% of the various underlying causes. By concentrating one's efforts on rectifying the vital 20%, one can have the greatest immediate impact on product quality.

Question 14 : [MTP – October 2019]

X Technologies Ltd. develops cutting-edge innovations that are powering the next revolution in mobility and has nine tablet smart phone models currently in the market whose previous year financial data is given below :

Model	Sales (₹ '000)	Profit Volume Ratio
Tab - A001	5,100	3.53%
Tab - B002	3,000	23.00%
Tab - C003	2,100	14.29%
Tab - D004	1,800	14.17%
Tab - E005	1,050	41.43%
Tab - F006	750	26.00%
Tab - G007	450	26.67%
Tab - H008	225	6.67%
Tab - I009	75	60.00%

Required :

(i) Using the financial data, carry out a Pareto ANALYSIS (80/20 rule) of Sales and Contribution. **(8 Marks)**

(ii) DISCUSS your findings with appropriate RECOMMENDATIONS. **(12 Marks)**

Answer 14 :

(i) Pareto Analysis Based on Sales :

Student Note : Fortunately the data given in the question is already arranged in the decreasing order of sales. That is from highest sales to lowest sale. We need to only calculate the % sales to total sales for each item and cumulative % sales to do Pareto analysis as follows :

Model	Sales (₹ '000)	% Sales	Cumulative % Sales
Tab - A001	5,100	35.05%	35.05%
Tab - B002	3,000	20.62%	55.67%
Tab - C003	2,100	14.43%	70.01%
Tab - D004	1,800	12.37%	82.47%
Tab - E005	1,050	7.22%	89.69%
Tab - F006	750	5.15%	94.84%
Tab - G007	450	3.09%	97.93%
Tab - H008	225	1.55%	99.48%
Tab - I009	75	0.52%	100.00%
Totals	14,550	100.00%	

Pareto Analysis Based on Contribution :

Student Note : First we need to calculate contribution earned on each model of phone. It can be calculated as (Sales x PV Ratio) as follows :

Model	Sales (₹ '000)	Profit Volume Ratio	Contribution (₹ '000)
Tab - A001	5,100	3.53%	180.03
Tab - B002	3,000	23.00%	690.00
Tab - C003	2,100	14.29%	300.09
Tab - D004	1,800	14.17%	255.06
Tab - E005	1,050	41.43%	435.02
Tab - F006	750	26.00%	195.00
Tab - G007	450	26.67%	120.01
Tab - H008	225	6.67%	15.01
Tab - I009	75	60.00%	45.00

Student Note : Now we need to re-arrange it in the decreasing order of contribution. That is from highest contribution to lowest contribution. Then we need to calculate the % contribution of each model to the total contribution earned on all the models. Thereafter we can calculate cumulative contribution % to do Pareto analysis as follows :

Model	Contribution (₹ '000)	Contribution %	Cumulative %
Tab - B002	690.00	30.87%	30.87%
Tab - E005	435.02	19.46%	50.33%
Tab - C003	300.09	13.43%	63.76%
Tab - D004	255.06	11.41%	75.17%
Tab - F006	195.00	8.72%	83.89%
Tab - A001	180.03	8.05%	91.94%
Tab - G007	120.01	5.37%	97.31%
Tab - I009	45.00	2.01%	99.32%
Tab - H008	15.01	0.68%	100.00%
Totals	2,235.22	100.00%	

(ii) Recommendations :

Pareto Analysis is a rule that recommends focus on most important aspects of the decision making in order to simplify the process of decision making. The very purpose of this analysis is to direct attention and efforts of management to the product or area where best returns can be achieved by taking appropriate actions.

Pareto Analysis is based on the 80/20 rule which implies that 20% of the products account for 80% of the revenue. But this is not a fixed percentage rule. In general business sense, it means that a few of the products, goods or customers may make up most of the value for the firm.

In present case, five models namely A001, B002, C003, D004 account for more than 80% of total sales whereas more than 80% of the company's contribution is derived from five models B002, E005, C003, D004 and F006.

Models B002 and E005 together account for 50.33% of total contribution but having only 27.84% share in total sales. So, these two models are the key models and should be the top priority of management. Both C003 and D004 are among the models giving 80% of total contribution as well as 80% of total sales so; they can also be clubbed with B002 and E005 as key models. Management of the company should allocate maximum resources to these four models.

Model F006 features among the models giving 80%of total contribution with relatively lower share in total sales. Management should focus on its promotional activities.

Model A001 accounts for 35.05% of total sales with only 8.05% share in total contribution. Company should review its pricing structure to enhance its contribution.

Models G007, H008 and I009 have lower share in both total sales as well as contribution. Company can delegate the pricing decision of these models to the lower levels of management, thus freeing themselves to focus on the pricing decisions for key models.

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5 COST MANAGEMENT FOR SPECIFIC SECTORS

Important Note

Dear Student Friends,

This chapter is deleted from your syllabus w.e.f. November, 2021 exam and onwards. Hence, no questions are kept here to reduce your burden.

Please move on to the next chapter.

*****

6 DECISION MAKING

Questions on Cost BEP

PROBLEM NO. 1 :

A Company has the option of buying one machine out of the two machines available - Machine M and Machine N. Both the machines produces identical products and their annual demand in the market is 10,000 units @ Rs. 10 per unit. Relevant data is produced below:

Particulars	Machine M	Machine N
Annual Output (units)	10,000	10,000
Fixed Cost p.a.	Rs. 30,000	16,000
Profit at above output	Rs. 30,000	24,000

You are required to calculate -

(a) Break-even point for each;

(b) The level of sales at which both machines are equally profitable and

(c) The range of sales at which one is more profitable than the other.

Solution 1 :

BEP (Machine M) = 5,000 units; BEP (Machine N) = 4,000 units; Cost BEP = 7,000 units

For output below 7,000 units p.a. Machine N is better and for output above 7,000 units p.a., Machine M is better.

PROBLEM NO. 2 :

M Company's Central Services Department is evaluating new copying machines to replace the firm's current copier, which is worn out. The analysis of alternative machines has been narrowed to three and the estimated costs of operating them are shown below :

Particulars	Cost Per 100 copies (Rs.)		
	Machine A	Machine B	Machine C
Materials Cost	60	40	20
Labour Cost	80	30	20
Annual Lease Cost	30,000	58,000	1,00,000

Required :

i) Compute the cost indifference point for the three alternatives.

ii) What do the cost indifference points suggest as a course of action in this regard?

iii) If the management expects to need 87,000 copies next year, which copier would be the most economical?

Solution 2 :

(i) A & B = 40,000; B & C = 1,40,000; A & C = 70,000 copies;

(ii) Up to 40,000 copies - Machine A is better, between 40,001 to 1,40,000 copies – Machine B is better and beyond 1,40,000 copies – Machine C is better.

(iii) For 87,000 – Machine B is good.

Note : The cost data given is for 100 copies. Hence, multiply your answer by 100 to get the exact number of copies.

PROBLEM NO. 3 :

The following are costs data for three alternative ways of processing the clerical work for cases brought before the LC Court System :

Particulars	A Manual	B Semi-automatic	C Fully automatic
Monthly Fixed Costs :	Rs.	Rs.	Rs.
Occupancy	15,000	15,000	15,000
Maintenance Contract	0	5,000	10,000
Equipment lease	0	25,000	1,00,000
Total	15,000	45,000	1,25,000

Unit variable costs (Per Report)	Rs.	Rs.	Rs.
Supplies	40	80	20
Labour	5hrs x 40 = 200	1hr x 60 = 60	0.25 hr x 80 = 20
Total	240	140	40

Required :

(i) Calculate cost indifference points. Interpret your results.

(ii) If the present case load is 600 cases and it is expected to go up to 850 cases in near future, which method is most appropriate on cost considerations ?

Solution 3 :

[A] Manual & Semi- automatic = 300 cases

[B] Semi-automatic & fully automatic = 800 cases

[C] Manual & fully automatic = 550 cases

Conclusion :

(i) Interpretation of results : between 0 – 300 cases per month manual system is better, beyond 300 cases per month but up to 800 cases per month semi automatic machine is better and beyond 800 cases per month fully automatic is better.

(ii) At 600 cases per month semi-automatic system is better, however considering increase in case to 850 in near future, it is advisable to go for fully automatic system.

Questions on Continue or Shut Down

Question 4 : [RTP - May 2021]

Micro-guard Industries Limited (MGIL) is a renowned company for a unique range of thoughtfully engineered products, designed to provide simplified solutions and upscale your home interiors. MGIL is engaged in the manufacturing of Power Systems, Batteries, Wires & Cables, Switch Gears & Modular Switches etc. But MGIL is largely famous for its wide range of Voltage Stabilizers. Each product is manufactured in a separate division.

While planning regarding voltage stabilizers division (VSD) for the first half of the fiscal year 20-21 amid the outbreak of COVID-19, the board gets through a report from internal expert committee pertaining to crystal series of voltage stabilizers which says – 'due to restricted availability of the input factors (on account of lock-down by the government), only 40,000 crystal voltage stabilizers (CVS) are expected to be manufactured and sold during the first half of fiscal year, as against the normal capacity of 75,000 units per quarter, that too at ₹ 1,600/- per CVS'. At normal capacity level, it incurs the following cost to manufacture and sell single unit of CVS –

Particulars	Amount (₹)
Direct Material	575
Direct Labour	215
Variable Overhead	310
Fixed overhead	300
Total Cost per unit	**1,400**

One of the directors suggested – 'since migrant workers moved to their home states and expected to come back in 3 to 5 months' time, hence it is better to temporary discontinue (lock-out) the production for the first half of fiscal'. Another director supports him by stating – 'it will give an opportunity to our retailers to clear the old stock available with them'. On the reference by the board, you (chief management accountant of MGIL) provide an estimate to management that 1/3rd of the fixed overheads at a normal capacity level are unavoidable and additional cost due to discontinue (lock-out) of plant for 6 months and resumption thereafter is ₹ 35 lakhs.

Required :

You are required to ADVISE the management on –

(i) Shall they continue the production of CVS or temporary discontinue (lock-out) for the first half of the fiscal year? (consider monetary aspects only)

(ii) The qualitative factors which needs to be considered, while deciding either to discontinue (lock-out) or continue.

(iii) What are the minimum number of CVS that VSD needs to manufacture and sell; in order to economically justify the continuation of the production.

Answer 4 :

Student Note : If we calculate the 'Shut Down Point', then we can answer part (iii) as well as part (i) of the question together.

(i) Calculation of Shut Down Point and Decision :

Fixed cost on continuation	= 300 per unit x 75,000 units per quarter
	= 225 lakhs per quarter
	i.e. ₹ 450 lakhs for the half year
Fixed cost of Shut down	= Unavoidable cost + additional cost of resumption
	= (1/3 x 450 L) + 35 L = ₹ 185 lakhs for 6 months
Contribution per unit	= Sales price - Variable cost
	= 1,600 - (575 + 215 + 310) = ₹ 500 per unit
Shut down point	= Difference in Fixed cost / Contribution per unit
	= (450L - 185 L) / 500
	= 53,000 units for half year (i.e. 6 months)

It means, if the expected production & sales is below 53,000 units; then it is advisable to temporarily shut down the business. It is the minimum number of CVS that VSD needs to manufacture and sell; in order to economically justify the continuation of the production.

Decision : As we expect to manufacture and sell only 40,000 units during the first half of the fiscal year, it is advisable to lock down / shut down the business for next 6 months.

(ii) Qualitative factors, while deciding either discontinue (lock-out) or continue :

(a) Government advisory regarding lock-down and lock-in – MGIL is legally bound to observe and comply with government advisories regarding lock-down and lock-in during COVID-19 situation, irrespective of economical impact.

(b) Customer relations – Discontinuing the production, even temporary may cause adverse reactions from customers. They may move to another product or brand which capable to substitute CVS. Customers may not return back in future after we open up again.

(c) Retailers relations – The trade relation with retailers of VSD may turn bitter if our supply is halted. It may also cause a loss of goodwill. Although the director argued that retailers can sell the old stock available with them, but it is nowhere mentioned that whether all the retailers have a requisite amount of stock in order to cater the needs of their customers.

(d) Employee/Worker relations – One of the directors mentioned that migrant workers moved to their home states and expected to come back in 3 to 5 months. It is important to identify how much of the workforce at VSD is migrant and what is the duration of lock-down announced by the Government. Is there any relaxation in the same (for example working with 1/3 or 1/2 capacity)? VSD also needs to consider guidelines and terms of the agreement with workers, in regard to the compensation they will get, if it is decided to lock-out (temporarily discontinue the production). Apart from this, workers' morale is also an important factor to consider.

(e) Whether discontinuing a segment have adverse effects on the sale of other products – CVS is a complementary product to other models sold by VDS and product sold by MGIL. Hence, impact of discontinuing the production of CVS on sale of these related products need to be considered.

Questions on Relevant & Irrelevant Cost

PROBLEM 5 :

A construction company has accepted contract AX and work thereon is about to begin. However, the company has received an offer for another contract BX. The company cannot, due to certain constraints, take up both the contracts simultaneously. In case the company is desirous of taking up contract BX, it can get the first contract AX rescinded upon payment of a penalty of Rs. 70,000.

The following are the estimates relating to the two contracts :

Particulars	Contract AX	Contract BX
Material X – in stock at original cost	54,000	-
Material Y – in stock at original cost	-	62,000
Material X – firm orders placed at original cost	76,000	-
Material X - Not yet ordered (at current cost)	1,50,000	-
Material Z - Not yet ordered (at current cost)	-	1,78,000
Labour – to be engaged and paid for	2,15,000	2,75,000
Site management costs	85,000	85,000
Travel and Other expenses	17,000	14,000
Depreciation of Plant	24,000	32,000
Interest on Capital at 12%	12,800	16,000
Head office Expenses allocated to contracts	31,690	33,100
Total	6,65,490	6,95,100
Contract Price	7,20,000	8,80,000
Estimated Profit	54,510	1,84,900

The following additional information is available :

— Material X is not in regular use. It can be used as a substitute for other materials, which are currently quoted at 10% less than the original cost of X.

— Material Y is in regular use and its price has doubled since it was purchased. Its net realisable value if sold will be its new price less 15%. It can, however, be kept in store for use in other contracts to be taken up in the next year.

— If contract AX is undertaken, a part of the plant having spare capacity can be hired out for a rental of Rs. 15,000 for the period.

— It is the policy of the company to charge notional interest on the estimated working capital at 12% per annum.

— Either of two contracts can be completed by 31st March, 2003, which is the close of the company's financial year.

— Site management cost is fixed.

Required :

(i) Using the relevancy of cost concept prepare a comparative statement to show the net benefit resulting from each contract.

(ii) Advise the management of the company as to which of two contracts should undertaken.

ANSWER 5 :

Statement showing estimated total cost using relevant cost approach

Particulars	Contract AX Rs.	Contract BX Rs.
Penalty payable for rescinding contract AX due to acceptance of contract BX	--	70,000
Material X in stock [This relevant cost is replacement cost i.e. 54,000 – 10%]	48,600	--
Material Y in stock [This material is in regular use, hence it replacement cost is relevant i.e. [62,000 x 2]	--	1,24,000
Material X firm orders already placed [current replacement cost is relevant] (76,000 – 10%)	68,400	--
Hiring charges of selling spare capacity [incremental revenue]	(15,000)	--
Material X not yet ordered [the current cost is relevant]	1,50,000	--
Material Z not yet ordered [current cost relevant]	--	1,78,000
Labour cost [variable cost hence relevant]	2,15,000	2,75,000
Site management cost [fixed cost, irrelevant]	--	--
Travel & other exp. [assumed to be variable cost hence relevant]	17,000	14,000
Depreciation on plant [it is assumed that depreciation is calculated on time basis, hence it is fixed cost irrelevant]	--	--
Interest on capital 12% [It is notional interest & not an actual incremental cost]	--	--
Head office exp. allocated [absorbed cost are irrelevant]	--	--
∴ Effective / total relevant cost	4,84,000	6,61,000
Contract price	7,20,000	8,80,000
Profit	2,36,000	2,19,000

Decision : Considering higher profits, it is advisable to accept contract AX.

Question No. 6 :

A company has decided to launch a new product X which is expected to have a demand of 10,000 units during the year at ₹ 160 per unit. The following information is furnished by the company:

(i) Material - The manufacture of one unit of X requires one unit of each of materials A, B and C.

Raw Material	Current Stock	Cost per unit (₹)		
	(Units)	Original Cost	Replacement Price	Resale Value
A – Regularly being used	10,000	16	20	14
B – Old stock (Not in use)	6,000	28	24	8
C – New stock	-	-	48	-

(ii) Direct labour

Skilled labour is paid at ₹ 80 per hour. It takes 0.25 hours/unit. Skilled labour has to be drawn from another production line which has a contribution of ₹ 240 per unit, with each unit requiring 2 hours of skilled labour.

Unskilled labour – 2 hours/unit @ ₹ 56 per hour. There is abundant unskilled labour in the factory, but according to an agreement with the labour union, no unskilled worker can be retrenched.

(iii) Variable overhead – ₹ 10 per unit.

(iv) Fixed Costs – no increase.

Required :

Using relevant cost approach, you are required to find out the average variable cost per unit of X.

Solution 6 :

Calculation of Average variable Cost per unit of 'X' :-

Particulars	₹
→ **Raw Material 'A'** – We have sufficient stock to take care of production requirement, hence no need to buy. However, as the material is regularly used, it's current purchase price i.e. replacement cost is relevant. [10,000 units x 20]	2,00,000
→ **Raw Material 'B'** – We have only 6,000 units in stock, which are of no use. Hence, resale value is relevant. For remaining 4,000 units, current purchase price is relevant. [(6,000 x 8) + (4,000 x 24)]	1,44,000
→ **Raw Material 'C'** – There is no available stock, hence entire quantity of 10,000 units is required to be purchased @ ₹ 48 each.	4,80,000
→ **Direct Labour** – Labour cost and opportunity cost (i.e. Loss of Contribution), both are relevant for decision making. Labour Cost [10,000 units x 0.25 hr./unit x ₹ 80/hr.] being variable cost Opportunity Cost [Labour hours x Contribution per hour] [(10,000 units x 0.25 hr./unit) x (240 / 2)] = [2,500 hrs. x 120 per hr.]	 2,00,000 3,00,000
→ **Unskilled Labour** – Not an incremental cost, hence irrelevant	Nil
→ **Variable OH** – (10,000 units x ₹ 10)	1,00,000
→ **Fixed OH** – Not an incremental Cost, hence irrelevant for decision making.	Nil
∴ Total variable cost	14,24,000
∴ Variable Cost p.u. [14,24,000 / 10,000 units]	142.40

Question No. 7 :

A Company has to decide whether to accept a special order or not for a certain product M in respect of which the following information is given :

Material A required	5,000 kg	Available in stock. It was purchased 5 years ago at ₹ 35 per kg. If not used for M, it can be sold as scrap @ ₹15 per kg.
Material B required	8,000 kg	This has to be purchased at ₹ 25 per kg from the market.
Other hardware items	₹ 10,000	To be incurred.
Dept. X – Labour oriented	5 men for 1 month @ ₹ 7,000 per month per man	Labour to be freshly hired. No spare capacity available.
Dept. Y– Machine oriented	3,000 machine hours @ ₹ 5 per machine hour	Existing spare capacity may be used.
Pattern and specification	₹ 15,000	To be incurred for M, but after the order, it can be sold for ₹ 2,000.

Considering relevant costs, find out the minimum value at which the company may accept the order.

Solution 7 :

Determination of Minimum Value of Special Order (considering relevant cost)

Cost Element	Relevant / Irrelevant	Calculation	Amount (₹)
Material – A	It has no alternative use, hence realisable value is relevant.	5,000 Kg. × ₹ 15	75,000
Material – B	It is not in stock and hence has to be purchased from market. Hence, relevant.	8,000 Kg. × ₹ 25	2,00,000
Other hardware items	Relevant as it is to be incurred.	Given in question	10,000
Dept X – Labour oriented	Relevant as fresh labour are to be hired.	5 men × 1 month × ₹ 7,000	35,000
Dept Y – Machine oriented	Irrelevant, as spare capacity is used. No incremental cost.	----	----
Pattern and Specification	Relevant, to be incurred. But, net cost after considering its resale value.	₹ 15,000 – 2,000	13,000
∴ Minimum Cost of Special Order			3,33,000

Question No. 8 :

A company can produce any of its 4 products, A, B, C and D. Only one product can be produced in a production period and this has to be determined at the beginning of the production run. The production capacity is 1,000 hours. Whatever is produced has to be sold and there is no inventory build-up to be considered beyond the production period. The following information is given :

Particulars	A	B	C	D
Selling price (₹/unit)	40	50	60	70
Variable cost (₹/unit)	30	20	20	30
No. of units that can be sold	1,000	600	900	600
No. of production hours required per unit of product	1 hour	1 hour and 15 minutes	1 hour and 15 minutes	2 hours

What are the opportunity costs of A, B, C and D ?

Solution 8 :

Statement Showing Calculation of Opportunity Cost

Product	**A**	**B**	**C**	**D**
(a) Selling Price (₹ per unit)	40	50	60	70
(b) Variable Cost (₹ per unit)	30	20	20	30
(c) Contribution (₹ per unit) [a – b]	10	30	40	40
(d) Demand (in units)	1,000	600	900	600
(e) No. of units that can be produced (within 1,000 hours of production capacity)	1,000 $\left(\frac{1{,}000\text{hrs}}{1\text{hr.}}\right)$	800 $\left(\frac{1{,}000\text{hrs}}{1.25\text{hr.}}\right)$	800 $\left(\frac{1{,}000\text{hrs}}{1.25\text{hr.}}\right)$	500 $\left(\frac{1{,}000\text{hrs}}{2\text{hr.}}\right)$
(f) No. of units that can be Sold (lower of demand and production)	1,000	600	800	500
(g) Possible total contribution (₹) [c × f]	10,000	18,000	32,000	20,000
(h) Opportunity Cost*	32,000	32,000	20,000	32,000

(*) Opportunity cost is the maximum possible contribution foregone by not producing alternative products i.e. if product A is produced then opportunity cost will be maximum of possible contribution from product B,C and D i.e. ₹ 32,000. Same is for Product B and D. In case of product C opportunity cost will be the maximum of possible contribution from product A, B and D i.e. ₹ 20,000.

Question No. 9 :

Quickcomp is a successful version of a software package that is widely used. Fastercomp is the next version, for which the development is complete and it is ready to be sold immediately in the market as budgeted. However, for Fastercomp, user manuals, training modules and diskettes have not yet been made, whereas, for the Quickcomp version, these are overstocked by 5,000 units. Release of Fastercomp will render the Quickcomp version not saleable.

The following information is provided:

Particulars	Quickcomp	Fastercomp
Selling price per unit ₹	14,000	19,000
Variable cost per unit ₹ (consisting of user manuals, training modules and diskettes)	1,000	4,000
Development Cost per unit ₹ (total cost of development spread over the expected sales quantity during the products' life cycle)	7,000	10,000
Marketing / Administration Cost per unit ₹ (Fixed budgeted annual outflow divided by the expected sales quantity for each product p.a.)	3,500	4,000
Total Cost per unit ₹	11,500	18,000
Operating Income per unit ₹	2,500	1,000

From a purely financial perspective, the company wants your advice whether to delay the release of the new version by 2 months, by when the inventory of the existing version would have sold out or to release the new version immediately. Support your advice with relevant figures.

Solution 9 :

Particulars	Quickcomp	Fastercomp	Remarks
Sale Price	14,000	19,000	Given
Less:			
Variable Cost	---	4,000	Quickcomp variable cost is Sunk cost
Development Cost	---	---	Sunk Cost
Marketing Cost	---	---	Sunk Cost
Hence, Profit	14,000	15,000	
Incremental Profits is ₹ 1000/- per unit.			
Decision:			
Release Fastercomp now in order to get higher profit by 5000 units x 1000 = ₹ 50 lacs.			

Question No. 10 :

Buildico, a company that builds houses presents the following facts relating to a certain housing contract that it wishes to undertake :

The CEO's and Marketing Director's food and hotel expense of 3,750 were incurred for a meeting with prospective client.

1,200 kgs of raw material Z will be required for house. Inventory of Z available is 550 kg. It was purchased at ₹ 580 per kg. It is used by Buildico in other projects. Its current market price is ₹ 650 per kg. Its resale value is ₹ 350 per kg.

The house will require 90 hours of engineer's time. The engineers are paid a fixed monthly salary of ₹ 47,500 per engineer who can work 150 hours a month. Spare time is not available now and an engineer has to be hired for this house for one month. He cannot be used in any other project once he does this contract.

Buidico will use a special earthquake proof foundation material. This was developed by Buildico at a cost of ₹ 30,000 for some other project that had to be abandoned. If it does not use it in this project, it can use it in some other project and charge the client ₹ 50,000 for it.

A list of items is given below. You are required to name the type of cost and state whether it is relevant or not in calculating the cost of the given housing project :

Sr.No.	Item	Type of cost	Relevant/Irrelevant
1	Food and hotel expenses ₹ 3,750		
2 (i) (ii)	Material Z : 550 kg x ₹ 580 per kg Material Z : 550 kg x ₹ 650 per kg		
3. (i) (ii)	Engineer's Salary ₹ 47,500 Engineer's free time cost 60/150 x 47,500		
4 (i) (ii)	Design cost ₹ 30,000 Design cost ₹ 50,000		

Solution 10 :

S.N.	Item of cost	Type of Cost	Relevant / Irrelevant
1	Food and hotel expenses 3,750	Sunk cost	Irrelevant
2 (i)	Material Z : 550 kg x ₹ 580 / kg	Historical cost/ Sunk cost	Irrelevant
(ii)	Material Z : 550 kg x ₹ 650 / kg	Replacement Cost	Relevant
3 (i)	Engineer's Salary ₹ 47,500	Incremental cost	Relevant
(ii)	Engineer's free time cost 60/150 x ₹ 47,500	Committed cost / unavoidable cost	Irrelevant
4 (i)	Design cost ₹ 30,000	Sunk cost	Irrelevant
(ii)	Design Cost ₹ 50,000	Opportunity Cost / Realisable value	Relevant

Product Mix Decision / Key Factor Questions

PROBLEM 11 :

Vinak Ltd., which produces 3 products furnished you the following data :

Products		A	B	C
Selling Price per unit	Rs.	100	75	50
Profit Volume Ratio	%	10%	20%	40%
Maximum Sales Potential	Units	40,000	25,000	10,000
Raw Material content as % of variable costs		50 %	50 %	50%

The fixed expenses are estimated at Rs. 6,80,000. The company uses a single raw material in all the three products. Raw material is in short supply and the company has a quota for the supply of raw material of the value of Rs. 18,00,000 for the manufacture of its products to meet its sales demand.

You are required to –

(i) Set a product mix which will give a maximum overall profit keeping the short supply of raw materials in view;

(ii) Compute the maximum profit.

Solution 11 :

Vinak Ltd.

Statement showing contribution per rupee of raw material [Key factor]

	Particulars	Products		
		A (Rs.)	B (Rs.)	C (Rs.)
a)	Selling price p.u.	100	75	50
b)	P/V Ratio percentage	10%	20%	40%
c)	Contribution p.u. (a x b)	10	15	20
d)	Variable cost p.u (a – c)	90	60	30
e)	Raw material % of Variable cost	50%	50%	50%
f)	Raw material cost p.u. (d x e)	45	30	15
g)	Contribution per rupee of Raw Material (c/f)	0.22	0.50	1.33
h)	Priority	III	II	I

Allocation of Available Raw Material-

Product	Product Mix (units)	RM per unit (Rs.)	Raw Material Used (Rs.)	Balance Raw Material (Rs.)
Total available RM				18,00,000
Used for C	10,000	15	1,50,000	16,50,000
Used for B	25,000	30	7,50,000	9,00.000
Bal. used for A	20,000	45	9,00,000	NIL

Computation of Maximum profit:

Particulars	Rs.	Rs.
Contribution :		
Product 'A' (20,000 units x Rs.10)	2,00,000	
Product 'B' (25,000 units x Rs.15)	3,75,000	
Product 'C' (10,000 units x Rs. 20)	2,00,000	7,75,000
(-) Fixed costs		6,80,000
Therefore, Maximum profit		95,000

PROBLEM 12 :

Taurus Ltd., produces three products A, B and C from the same manufacturing facilities. The cost and other details of the three products are as follows –

Particulars		A	B	C
Selling price per unit	Rs.	200	160	100
Variable cost per unit	Rs.	120	120	40
Fixed expenses per month Rs. 2,76,000				
Maximum production per month in 200 hours	Units	5,000	8,000	6,000
Total hours available for the month 200 hours				
Maximum demand per month	Units	2,000	4,000	2,400

The processing hours cannot be increased beyond 200 hours per month.

You are required to compute the most profitable product-mix.

Solution 12 :

Taurus Ltd.

Statement showing contribution per processing hour [key factor] of the three products

SN	Particulars	A	B	C
1	Maximum production per month [units]	5,000	8,000	6,000
2	Maximum hours available per month	200	200	200
3	Output per hour [units] [(1)/(2)]	25	40	30
4	Selling price (Rs)	200	160	100
5	Variable cost p.u. (Rs)	120	120	40
6	Contribution p.u. (Rs) [(4) – (5)]	80	40	60
7	Contribution per hour [(3) x (6)]	2,000	1,600	1,800
8	Priority to manufacture	I	III	II

Statement showing most profitable product mix –

Product	Product Mix (Units)	Calculations	Hrs. used	Balance Hrs. 200
A	2000	[2000 / 25]	80	120
C	2400	[2,400 / 30]	80	40
B	1600	[40 hrs. x 40 units]	40	NIL

PROBLEM 13 :

From the following particulars, find the most profitable product mix and prepare a statement of profitability at that product mix :-

Particulars	Product A	Product B	Product C
Units budgeted to be produced and sold	1,800	3,000	1,200
Selling price per unit Rs.	60	55	50
Requirement per unit :			
Direct Material	5 Kg	3 Kg	4 Kg
Direct Labour	4 hrs	3 hrs	2 hrs
Variable Overheads	Rs. 7	Rs.13	Rs. 8
Fixed Overheads	Rs.10	Rs.10	Rs.10
Cost of Direct Material per kg.	Rs. 4	Rs. 4	Rs. 4
Direct Labour Hour Rate	Rs. 2	Rs. 2	Rs. 2
Maximum Possible Units of Sales	4,000	5,000	1,500

All the three products are produced from the same direct material using the same type of machines and labour. Direct labour, which is the key factor, is limited to 18,600 hours.

Solution 13 :

Statement showing contribution per hour (key factor) of the three products

SN	Particulars	A	B	C
1	Direct labour required for producing one unit	4 hrs.	3 hrs.	2 hrs.
2	Variable cost per unit (Rs.)			
	Direct material [Qty x rate]	20	12	16
	Direct Labour [hrs x Rate]	8	6	4
	Variable Overheads	7	13	8
	Sub total (2)	35	31	28
3	Selling price p.u. (Rs.)	60	55	50
4	Contribution p.u. (Rs) (3 – 2)	25	24	22
5	Contribution per hour [(4)/(1)]	6.25	8.00	11.00
6	Priority to manufacture	III	II	I

Statement showing most profitable product mix –

Particulars	Product	Units	Total Hrs.	Bal. Hrs.
Total available hrs.				18,600
Maximum possible sales	C	1,500	3,000	15,600
Maximum possible sale	B	5,000	15,000	600
Production in bal. hrs. [600/4]	A	150	600	NIL

Statement showing profitability of product mix –

SN	Contribution :-		Rs.
1	Product A [150 units x Rs.25]		3,750
2	Product B [5000 units x Rs.24]		1,20,000
3	Product C [1500 units x Rs.22]		33,000
	Therefore, Total contribution		1,56,750
	Less : Total fixed cost :-		
	A - 1800 units x Rs.10 =	18,000	
	B - 3000 units x Rs.10 =	30,000	
	C - 1200 units x Rs.10 =	12,000	60,000
	Therefore, Profit		96,750

PROBLEM 14 :

A company engaged in plantation activities has 200 hectares of virgin land which can be used for growing jointly or individually tea, coffee and cardamom. The yield per hectare of the different crops and their selling price per kg. are as under :

Crop	Yield per Hectare (kgs.)	Selling Price per Kg. (Rs.)
Tea	2,000	20
Coffee	500	40
Cardamom	100	250

The relevant cost data is given below :

Variable Cost per kg. (Rs.)	Tea	Coffee	Cardamom
Labour Charges	8	10	120
Packing Material	2	2	10
Other Costs	4	1	20

Fixed Cost p.a. :	Rs.
Cultivation and Growing Cost	10,00,000
Administration Cost	2,00,000
Land Revenue	50,000
Repairs and Maintenance	2,50,000
Other Costs	3,00,000

The policy of the Company is to produce and sell all the three kinds of product and the maximum and minimum area to be cultivated per product is as follows :

Crop	Hectares	
	Maximum	Minimum
Tea	160	120
Coffee	50	30
Cardamom	30	10

Calculate the most profitable mix and maximum profit which can be achieved.

Solution 14 :

Statement showing contribution per hectare of land (key factor)

SN	Particulars	Tea Rs.	Coffee Rs.	Cardamom Rs.
A	Selling price per kg.	20	40	250
B	Variable cost per kg.			
	Labour charges	8	10	120
	Packing Material	2	2	10
	Other costs	4	1	20
	Sub total (b)	14	13	100
C	Contribution per kg. (a – b)	6	27	100
D	Yield per hectare (Kg)	2000	500	100
E	Contribution per hectare (c x d)	12000	13500	10000
F	Priority	II	I	III

Calculation of Product Mix : (Allocation of land)

Particulars	Land to be cultivated (hectares)	Balance of uncultivated (hectares)	Yield (kgs.)
Total available land		200	
Used for Coffee – Maximum for Rank I	50	150	25,000
Used for Cardamom – Minimum for Rank III	10	140	1,000
Used for Tea – Balance for Rank II	140	NIL	2,80,000

Statement showing maximum achievable profit at the optimum product mix :

Particulars	Rs.	Rs.
Contribution :		
Tea (140 hect. X Rs.12,000)	16,80,000	
Coffee (50 hect. X Rs.13,500)	6,75,000	
Cardamom (10 Hect x Rs.10,000)	1,00,000	24,55,000
Less : Total Fixed cost		18,00,000
Maximum Profit		**6,55,000**

Question 15 : [Jan. 2021 Exam - 10 Marks]

Modem Packaging Corporation specialised in the manufacturing of one litre plastic bottles. The firm has four moulding machines, each capable of producing 100 bottles per hour. The firm estimates that the variable cost of producing a plastic bottle is ₹ 20. The bottles are sold ₹ 50 each.

Management has been approached by a local toy company that would like the firm to produce a moulded plastic toy for them. The toy company is willing to pay ₹ 300 per unit for the toy. The variable cost to manufacture the toy will be ₹ 240. In addition, Modem Packaging Corporation would have to incur a cost of ₹ 20,00,000 to construct the needed mould exclusively for this order. Because of more intricate shape of the toy, a moulding machine can produce only 40 units per hour. The customer wants 1,00,000 units. Assume that total capacity of all the four machines combined is 10,000 machine hours available during the period in which the toy company wants the delivery of toys.

The firm's fixed cost, excluding the cost-to-construct the toy mould, during the same period will be ₹ 2,00,00,000.

Required :

(i) If the management predicts that the demand for its bottles will require the use of 7,500 machine hours or less during the period, should be special order be accepted? Give reasons. **(3 Marks)**

(ii) If the management predicts that the demand for its bottles will be higher than its ability to produce bottles, should the order be accepted? Why? **(2 Marks)**

(iii) If the management has located a firm that has just entered the moulded plastic business. This firm has considerable excess capacity and more efficient moulding machines and is willing to subcontract the toy job, or any portion of it for ₹ 280 per unit. It will construct its own toy mould.

DETERMINE Modem Packaging Corporation's minimum expected excess machine hour capacity needed to justify producing any portion of the order itself rather than subcontracting it entirely. **(5 Marks)**

Answer 15 :

Workings : Statement showing "Contribution / Machine Hour"

Particulars	'Bottle'	'Toy'
Sales price (₹ /unit)	50	300
Less: Variable Cost (₹ /unit)	20	240
Less: Specific cost of mould (₹ /unit)	-	*20
∴ Contribution (₹ /unit)	**30**	**40**
Output per machine hour	100 units	40 units
∴ Contribution / Machine Hour	**3,000**	**1,600**

* (₹ 20,00,000 / 1,00,000 units) = ₹ 20 per unit

(i) To produce 1,00,000 toys, we will need 2,500 hours (i.e. 1,00,000 / 40). Modem Packaging Corporation can accept plastic moulded toy's order as sufficient number of hrs. i.e. 2,500 hrs. (10,000 hrs. – 7,500 hrs.) are available and would be able to generate additional benefit of ₹ 40 per unit on 1,00,000 units of toys i.e. ₹ 40,00,000.

(ii) If the demand for bottle is higher, then more hrs. will be required to produce the additional bottles. Modem Packaging has to decide whether to utilize 2,500 hrs. for bottles or for toy Order.

Machine time becomes a limiting factor. Therefore, contribution per machine hour from both the activities (i.e. bottles and toys) should be calculated to decide whether the order should be accepted or not. Contribution per machine hour is higher in case of bottles (refer workings). Therefore, Modem Packaging should utilize the remaining 2,500 hours for manufacturing bottles rather than to fulfill the order for supply of toys.

(iii) To compare own manufacture versus subcontract the manufacture of toys, we need to compare incremental cost of both the options. Let's assume the no. of toys as 'X' at which the incremental cost of manufacture and subcontract will be same.

Incremental cost of manufacture = Incremental cost of subcontract

240X + 20,00,000 = 280X

20,00,000 = 280X - 240X

Hence, X = 50,000 toys

Thus as long as company has excess capacity available to manufacture more than **50,000 toys** it is cheaper **to produce** than to buy from subcontractor.

Minimum Excess Machine Hour Capacity needed to justify production = $\left[\frac{\text{50,000 toys}}{\text{40 toys/hr.}}\right]$

= 1,250 hours

Sell or Further Process Decision

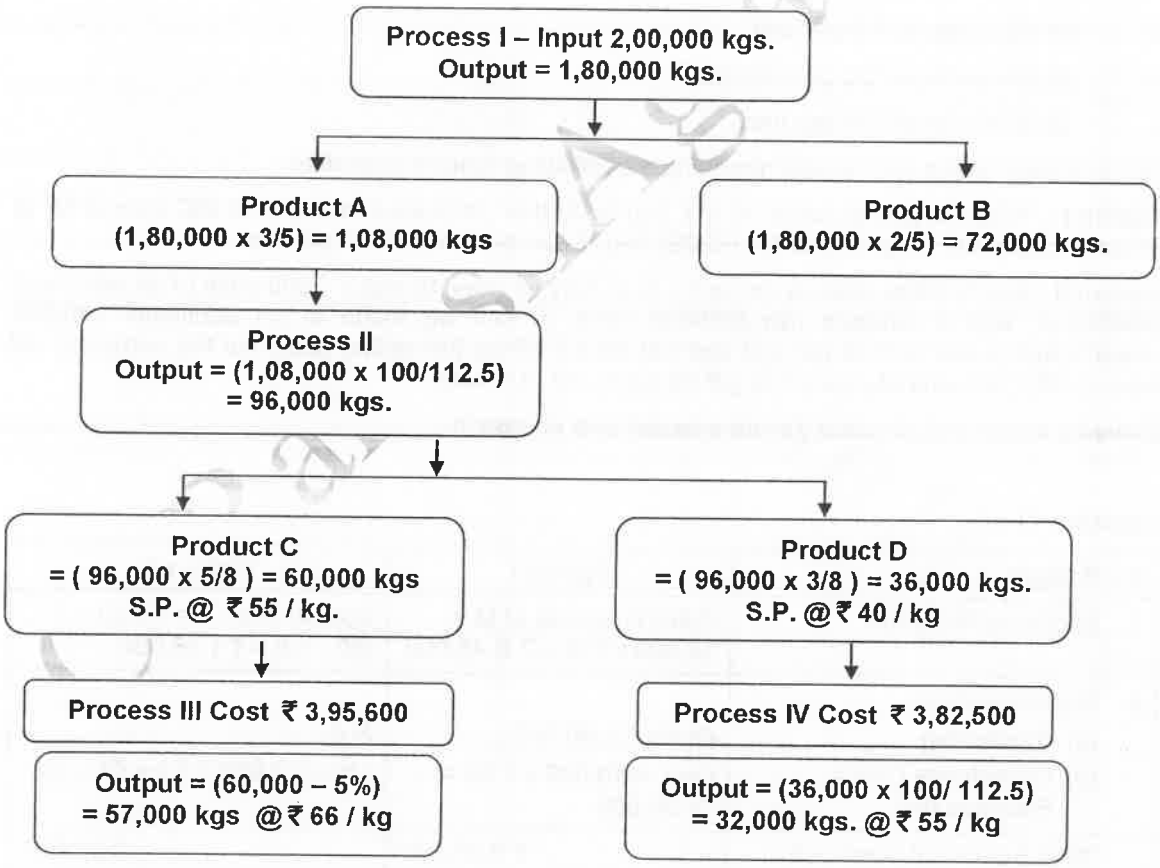
PROBLEM NO. 16 :

A company processes different products from a certain raw material. The raw material is processed in process I (where normal loss is 10% of input) to give products A and B in the ratio 3 : 2. B is sold directly. A is processed further in process II (where normal loss is 12.5% of output) to give products C and D in the ratio 5 : 3. At this point C and D have sale values ₹ 55 and ₹ 40 per kg respectively. C can be processed further in process III with processing cost ₹ 3,95,600 and normal wastage 5% of input and then be sold at ₹ 66 per kg. D can be processed further in process IV with processing cost ₹ 3,82,500 and normal wastage 12.5% of output and then be sold at ₹ 55 per kg. The normal wastage of each process has no realizable value. During the production period, 2,00,000 kgs. of raw material is to be introduced into Process I.

Using incremental cost-revenue approach, advise whether sale at split-off or further processing is better for each of the products C and D.

Solution 16 :

Process Flowchart



Statement of Incremental Profit / (Loss) :

Particulars	Product `C'	Product `D'
a. Sale value after processing	37,62,000 (57,000 x 66)	17,60,000 (32,000 x 55)
b. Sale value at split off	33,00,000 (60,000 x 55)	14,40,000 (36,000 x 40)
c. Incremental Revenue (a – b) d. Incremental processing cost	4,62,000 (3,95,600)	3,20,000 (3,82,500)
e. Incremental Profit / (Loss) [c – d]	66,400	(62,500)
f. Decision	Process further	Sale at split off

PROBLEM NO. 17 :

Pigments Ltd. is a chemical factory producing joint products J, K and L at a joint cost of production of ₹ 9,60,000. The sales are:

J 60,000 units at ₹ 5 per unit,

K 20,000 units at ₹ 20 per unit and

L 40,000 units at ₹ 10 per unit.

The company seeks your advice regarding the following options available:

Option I : After the joint process, all of L can be further processed to make 36,000 units of M, at an additional processing cost of ₹ 1,80,000 and M can be sold at ₹ 18 per unit.

Option II : The facilities used to convert L to M may be used to make 7,000 units of an additional product A, with a different raw material input. A can be made at an additional variable manufacturing cost of ₹ 12 per unit and will fetch ₹ 30 as the selling price, but the company will have to offer one unit of J as a free gift for each unit of A sold.

Evaluate the proposals using the incremental cost approach.

Solution 17 :

Particulars	Option I	Option II
1. Additional Revenue	Sales Revenue of M = 36,000 x ₹18 = ₹ 6,48,000	Contrib. from A = 7,000 x ₹ (30 - 12) = ₹ 1,26,000
2. Additional Costs (a) Processing (b) Opportunity Cost = Revenue lost	 Given ₹ 1,80,000 On L = 40,000 x ₹ 10 = ₹4,00,000	 N.A. On J = 7,000 x ₹ 5 = ₹35,000
Total Additional Cost (a+b)	₹ 5,80,000	₹ 35,000
3. Net Additional Benefit (1 – 2)	**₹ 68,000**	**₹ 91,000**

Conclusion: Option II is preferable due to higher additional benefit.

Notes and Assumptions:

(a) Joint Cost of Production is a common cost or sunk cost and irrelevant for the decision.

(b) Sales Revenue of K is irrelevant, since it will be obtained in any case.

(c) Additional Processing Cost of ₹ 1,80,000 under Option I is assumed as processing related, and will be incurred only under Option I.

Minimum Pricing Decision

PROBLEM NO. 18 :

Shri. Kiran Manufactures lighters. He sells his product at Rs. 20 each and makes profit of Rs. 5 on each lighter. He worked 50% of his machinery capacity at 50,000 lighters. The cost of each lighter is as under :

Direct Material	Rs. 6
Wages	Rs. 2
Works Overhead	Rs. 5 (50% fixed)
Sales Expenses	Rs. 2 (25% variable)

His anticipation for the next year is that the cost will go up as under - Fixed Charges by 10%; Direct Labour by 20% ; and Material by 5%. There will not be any change in selling price.

There is an additional order for 20,000 lighters in the next year. What is the lowest rate he can quote for this additional order, so that he can earn the same profit as in the current year?

Solution 18 :

Final Answer : Revised Variable Cost per unit = Rs. 11.70

Revised total fixed cost = Rs. 2,20,000

Minimum Selling Price for the order = Rs. 14.45 per unit.

PROBLEM NO. 19 :

A company is operating at 60% of its capacity with a turnover of ₹ 43.20 lacs. If the company works at 100% capacity, the sales-cost relation is:

Factory cost is two thirds of sales value. Prime cost is 75% of factory cost. Administration and selling expenses (75% variable) are 20% of the sales value. Factory overhead will vary according to operating capacity as given below:

Operating capacity (%)	60	80	100	120
Factory overheads (₹ in lacs)	9.90	10.80	12	15

The company has planned to operate at 80% of its capacity for domestic sales. Moreover, it has received an export order and its execution will involve additional 40% of the capacity. The prime cost of the export order is estimated at ₹ 6.0 lacs and the shipping involved will be around ₹ 1.0 lakh. Administration and selling expenses will be avoided on the export order.

Using the same percentage of profits as on the domestic sales (i.e. 80% capacity), determine the minimum price to be quoted for the export order.

Solution 19 :

(i) Basic Data –

Sales at 100% capacity = $\frac{43.20 \text{ Lacs}}{60\%} \times 100\% = 72$ Lakhs

Factory Cost = 2/3 x 72 lacs = 48 lacs

Prime Cost = 75% x 48 Lacs = 36 lacs (i.e. 50% of sales)

∴ Factory OH = 25% x 48 lakhs = 12 lakhs

Admn. & Selling Exp. = 20% x 72 lakhs = 14.4 lakhs

Variable Admn. & Selling Exp. = 75% x 14.4 lakhs

= 10.8 lakhs (i.e. 15% of sales)

Fixed Admn. & Selling Exp. = 25% x 14.4 lakhs = 3.6 lakhs

Calculation of profit on domestic sales (80% capacity) –

Particulars	**₹ Lacs**
Domestic sales (80% x 72 lakhs)	57.60
Less : Prime Cost (50% of sales 57.60)	28.80
Less : Factory OH (given in the table above)	10.80
Less : Variable Admn. & Selling Exp. (15% of 57.60)	8.64
Less : Fixed Admn. & Selling Exp.	3.60
∴ Minimum Price Quotation	5.76
Profit % on domestic sales [5.76 / 57.60]	10% of sales i.e. 1/9th of cost

(ii) Calculation of minimum price for export order –

Particulars	**₹ Lacs**
Prime Cost	6.00
Shipping cost	1.00
Incremental Factory OH i.e. (120% - 80%) (15 lacs – 10.80 lacs)	4.20
Incremental Admn. & Selling Exp.	NIL
∴ Total Incremental Cost	11.20
Add: Profit @ 1/9th of Cost	1.24
∴ Minimum Price Quotation	12.44

PROBLEM NO. 20 :

XL Polymers, located in Sahibabad Industrial Area, manufactures high quality industrial products. AT Industries has asked XL Polymers for a special job that must be completed within one week.

Raw material R (highly toxic) will be needed to complete the AT Industries special job. XL Polymers purchased the R two weeks ago for ₹ 7,500 for a job 'A' that recently was completed. The R currently in stock is the excess from that job and XL Polymers had been planning to dispose it off. XL Polymers estimates that it would cost them ₹ 1,250 to dispose off the R. Current replacement cost of R is ₹ 6,000.

Special job will require 250 hours of labour G_1 and 100 hours of labour G_2. XL Polymers pays their G_1 and G_2 employees ₹ 630 and ₹ 336 respectively for 42 hours of work per week.

XL Polymers anticipates having excess capacity of 150 [G_1] and 200 [G_2] labour hours in the coming week. XL Polymers can also hire additional G_1 and G_2 labour on an hourly basis; these part-time employees are paid an hourly wage based on the wages paid to current employees.

Suppose that material and labour comprise XL Polymer's only costs for completing the special job.

Required :

CALCULATE the 'Minimum Price' that XL Polymers should bid on this job?

Solution 20 :

Calculation of Minimum Price for a Special Job, using relevant cost approach:

Particulars	₹
(a) Cost of Material R – It is a sunk cost and hence irrelevant for decision making	NIL
(b) Savings in disposal cost of toxic material R	(1,250)
(c) Cost of Labour G_1 – Out of 250 hours needed for the special job, we already have excess 150 hours, hence the incremental cost of 100 hours is relevant. [₹ 630 / 42 hours x 100 hours]	1,500
(d) Cost of Labour G_2 – Out of 100 hours needed for the special job, we already have excess 200 hours; hence the incremental cost is NIL.	NIL
∴ Minimum Price for Special Job	250

Outsourcing Decision i.e. Make or Buy Decision

PROBLEM NO. 21 :

Delhi Equipment Ltd., manufactures four components, the cost particulars of which are given below –

COMPONENTS	A	B	C	D
Element of Costs :	**Rs.**	**Rs.**	**Rs.**	**Rs.**
Direct Material	80	100	100	120
Direct Labour	20	25	25	30
Variable Overhead	10	12	15	10
Fixed Overhead	15	23	20	20
Sub-total	125	160	160	180
Output per machine hour (units)	4	2	3	3

The key factor is shortage of machine capacity. You are required to advise the management as to whether they should continue to produce all or some of these components (which are used in its main products) or they should buy them from a supplier who has quoted the following prices :

A - Rs. 115, B - Rs. 175, C - Rs. 135, D - Rs. 185.

ANSWER 21 :

Delhi Equipment Ltd.

Statement showing cost of manufacturing & buying the components

Sr. No.	Particulars	Components			
		A Rs.	B Rs.	C Rs.	D Rs.
a)	Variable cost of manufacturing :-				
	Direct material	80	100	100	120
	Direct labour	20	25	25	30
	Variable overheads	10	12	15	10
	Subtotal (a)	110	137	140	160
b)	Cost of purchase from outside	115	175	135	185
c)	Advantage/Disadvantage of manufacturing (b-a)	5	38	(5)	25
d)	Output per machine hour [in units]	4	2	-	3
e)	Cost of saving one hour of machine [c x d]	20	76	-	75
f)	Priority of manufacturing	III	I	-	II

Advice :- Component 'C' is not advantageous to manufacture and hence to be bought from an outside supplier.

Component 'A','B' & 'D' are advantageous to manufacture instead of buying. But these components should be manufactured in the priority sequence of 'B', 'D' & 'A' out of the available machine hours.

The recommendation of buying the components from outside is based on certain assumptions as follows –

1) The components to be bought will be of the same quality as manufactured by us.
2) The supplier will be regular and prompt in supplying our requirements.
3) Supplier is supposed to keep his prices consistent in future also.
4) The purchase price quoted by the supplier is assumed to be the landed cost of components.

PROBLEM NO. 22 :

A company manufactures three components. These components pass through two of the company's departments P and Q. The machine hour capacity of each department is limited to 6,000 hours in a month. The monthly demand for components and cost data are as under :

Components	**A**	**B**	**C**
Demand (units)	900	900	1350
	Rs.	**Rs.**	**Rs.**
Direct Materials/unit	45	56	14
Direct Labour/unit	36	38	24
Variable Overheads/unit	18	20	12
Fixed overheads P @ Rs. 8 per hour	16	16	12
Q @ Rs. 10 per hour	30	30	10
Total	145	160	72

Components A and C can be purchased form market at Rs. 129 each and Rs. 70 each respectively.

You are required to prepare a statement to show which of the components in what quantities should be purchased to minimise the cost.

ANSWER 22 :

1. Statement showing available capacity and required capacity for the month

Particulars	**A**	**B**	**C**	**Total**
a. Hours / unit – Dept. P	2 (16/8)	2 (16/8)	1.5 (12/8)	--
b. Hours / unit – Dept. Q	3 (30/10)	3 (30/10)	1 (10/10)	--
c. Demand (units)	900	900	1,350	--
d. Hours required in dept. P to satisfy demand (a x c)	1,800	1,800	2,025	5,625
e. Hours required in dept. Q to satisfy demand (b x c)	2,700	2,700	1,350	6,750

Note : The available hours for each department is 6,000 hrs. On observing the above data, we find that in dept. P has sufficient hours to take care of the entire requirement. However, there is a shortage of 750 hrs. in dept. Q ((i.e. 6,750 – 6,000) to satisfy the demand.

2. Statement of cost of manufacture and cost of buying :

Particulars	A	B	C
a. Variable cost of manufacture / unit			
Direct material	45	56	14
Direct labour	36	38	24
Variable overheads	18	20	12
Sub-total (a)	99	114	50
b. Cost of purchase	129	--	70
c. Saving p.u. if manufactured (b – a)	30	--	20
d. Labour hrs. /unit of dept. Q	3	--	1
e. Saving per hour (c / d)	10	--	20

We save more if we manufacture C. Hence, we should manufacture C and buy A.
Therefore, No. of A to be purchased = Deficit capacity hrs. / hrs. per unit of A
= 750 hrs. / 3 hours = 250 units.

3. Make or Buy Decision Summary –

Product	Total required (units)	Make (units)	Buy (units)
A	900	650	250
B	900	900	--
C	1,350	1,350	--
Total	3,150	2,900	250

Question No. 23 : [Nov. 2019 Exam]

SEZ Limited produces three products S, Q and L which use the same resources but in varying quantities. Product S uses one unit of component P which is purchased from outside suppliers at ₹ 120 per unit. Details of the three products are as follows :

Particulars	S	Q	L
Annual Demand (units)	9,000	5,700	7,800
Data Per Unit :	₹	₹	₹
Selling Price	310	275	224
Component P	120	-	-
Direct materials (₹ 8 per kg.)	24	32	24
Skilled labour (₹ 40 per hour)	20	60	40
Unskilled labour (₹ 24 per hour)	18	24	36
Variable Overhead (₹ 6 per machine hour)	18	24	24

Annual fixed costs are ₹ 15,00,000.

Maximum availability of skilled labour is 16,200 hours. Other resources are sufficient to meet the annual demand / sales.

Engineering division of the company came forward with a proposal to make the component 'P' in house with the following costs break up :

Direct materials (₹ 8 per kg.)	₹ 24
Skilled labour (₹ 40 per hour)	₹ 40
Unskilled labour (₹ 24 per hour)	₹ 8
Variable Overhead (₹ 6 per machine hour)	₹ 18
Total cost per unit	**₹ 90**

For in-house making of the component 'P' there will not be any change in the annual fixed costs of the company. The company can either buy component 'P' or make it in house.

Required :

Recommend the optimum production plan and profit for the year. Show calculation in support of your answer. [10 Marks]

Solution 23 :

Approach : It is primarily a question based on key factor concept with make or buy decision. The key factor in this question is 'Skilled Labour Hours'. We need to calculate the contribution per skilled labour hour for Products S, Q & L. At the same time, we need to calculate savings per hour for component P, if we manufacture it. Then we have to decide the ranking and utilise our key resources based on such ranking.

(i) Statement of Contribution per hour and ranking :

Particulars	S	Q	L	P
(a) Variable Cost Per Unit :	₹	₹	₹	₹
Purchase price of component P	120	-	-	
Direct materials (₹ 8 per kg.)	24	32	24	24
Skilled labour (₹ 40 per hour)	20	60	40	40
Unskilled labour (₹ 24 per hour)	18	24	36	8
Variable Overhead (₹ 6 per machine hour)	18	24	24	18
Sub-total (a)	200	140	124	90
(b) Selling Price for Products S, Q, L and Purchase price for Component P	310	275	224	120
(c) Contribution or Savings per unit [b - a]	110	135	100	30
(d) Skilled labour hours per unit [Skilled labour cost / 40 per hour]	0.50	1.5	1.0	1.0
(e) Contribution or savings per hour [c / d]	220	90	100	30
(f) Ranking for production	I	III	II	IV

(ii) Optimum Production Plan as per ranking :

Particulars	No. of units	Hours per unit	Total hours	Balance hours
Total available skilled labour hours				16,200
Less : Used for max. demand of S	9,000	0.50	4,500	11,700
Less : Used for max. demand of L	7,800	1.00	7,800	3,900
Less : Balance hours used for Q	2,600	1.50	3,900	NIL

Note : In the above calculation, it may be noticed that we are not left with any time to produce component P. Hence, entire requirement of P is to be purchased from outside supplier.

(iii) Calculation of Profit for the year :

Particulars	₹
Contribution from :	
Product S : [9,000 units x 110 p.u.]	9,90,000
Product Q : [2,600 units x 135 p.u.]	3,51,000
Product L : [7,800 units x 100 p.u.]	7,80,000
Total contribution p.a.	21,21,000
Less : Annual Fixed cost	15,00,000
∴ Profit for the year	6,21,000

Question 24 : [RTP - May 2020]

Mount Sports Manufacturing Facilities (MSMF) deals in manufacturing of sports articles. Although MSMF is major market player but can capture the market further. Currently MSMF manufactures five types of badminton shuttle named as P-101, P-102, P103, P-104 and P-105. Production facilities are limiting factor at MSMF. Production and marginal cost data of these 5 products are specified in table below :

Particulars	P-101	P-102	P-103	P-104	P-105
Monthly production (in units)	1,000	1,200	2,000	3,000	1,500
Direct Material Cost (₹ per unit)	6	4	7	3	6
Direct Labour Cost (₹ per unit)	4	9	5	8	5
Variable Production Overhead (₹ per unit)	2	3	2	2	1

On drive to cost leadership strategy, MSMF is thinking to out-source some of the products. Shuttles can be sourced from a well-established company 'Protease' at the following prices. There is no tie-in between products, all products can outsource individually. These costs are on CIF basis :

Particulars	P-101	P-102	P-103	P-104	P-105
Outsourcing Cost / Buy in Cost (₹ per unit)	17	18	18	11	15

Company-wide fixed overheads are of ₹ 15 Lacs each year. Out of which ₹ 2,40,000 is directly attributable to the production of these 5 products on annual basis. This fixed overhead of ₹ 2,40,000 is evenly split across such 5 products and entirely avoidable. Till date company does not have experience to outsource any element of production.

Mr. Singh who is newly appointed management accountant, bring the huge experience to the organization on cost control and reduction techniques. While discussing the possibility of outsourcing with CFO, Mr. Singh explained the limitation of out-sourcing and also presents a white paper on gain sharing arrangement; which can be entered with supplier to whom outsourcing is considered.

CEO just entered into the office of CFO (where such discussion is ongoing) on verge of such discussion, but he heard about gain sharing arrangement and curious to know further about the same.

Required :

CEO post presentation / discussion seeks report from Mr. Singh to RECOMMEND, the product(s) which should be outsourced. Report should also EXPLAIN gain sharing arrangement along with aspects that MSMF need to consider, ensuring success out of gain sharing arrangement as a part of out-sourcing contract with Protease.

Answer 24 :

Report to :

Office of CEO,

Mount Sports Manufacturing Facilities (MSMF),

Dated – 03rd Jan 2020

Report on Outsourcing of Products to Protease

(i) Recommendation on out-sourcing of the products – Product P-102 and P-104 can be out-sourced. (see computations below)

Particulars	P-101	P-102	P-103	P-104	P-105
a. Monthly production (in units)	1,000	1,200	2,000	3,000	1,500
b. Direct Material Cost (₹ per unit)	6	4	7	3	6
c. Direct Labour Cost (₹ per unit)	4	9	5	8	5
d. Variable Production Overhead (₹ per unit)	2	3	2	2	1
e. Marginal Cost (₹ per unit) ...(b)+(c)+(d)	12	16	14	13	12
f. Monthly Total Variable Cost ...(e)×(a)	12,000	19,200	28,000	39,000	18,000
g. Monthly Allocable Fixed Overhead*	4,000	4,000	4,000	4,000	4,000
h. Total Monthly Cost Production-in-house ...(f)+(g)	16,000	23,200	32,000	43,000	22,000
i. Outsourcing Cost Cost(₹ per unit)	17	18	18	11	15
j. Total Monthly cost of outsourcing (i)×(a)	17,000	21,600	36,000	33,000	22,500

Total monthly cost of in house production is ₹ 1,36,200 and Total comparable monthly cost of outsourcing is ₹ 1,30,100. There is overall saving of ₹ 6,100, but since there is no tie-in between products, hence decision on all products whether can be outsourced or produced in-house can be taken individually.

The above calculation suggests that only P-102 and P-104 can be sourced through outsourcing due to, whereas P-101, P-103 and P-105 can be produced more cheaply in-house.

(*) Since avoidable in nature, hence relevant for decision making. ₹ 2,40,000 is annual cost, hence monthly fixed overhead expenditure will be ₹ 20,000, which is allocated to the products equally.

However, following aspects needs to be kept in mind, prior to entering to out-sourcing arrangement of product P-102 and P-104

Issue 1

If products P-102 and P-104 are outsourced, the company would then have spare capacity. Since the production function/capacity is a limiting factor and there is scope of selling the further units of P-101, P-103 and P-105; in order to acquire the market share. Hence, spare capacity is of great importance and will be a powerful argument for outsourcing.

Issue 2

The reaction of the workforce at MSMF is also need to be considered because of two reasons :

a. If production of P-101, P-103 and P-105 cannot be expanded to take up the spare capacity on account of out-sourcing of P-102 and P-104, then lay-off may be required – Which may cause problem like strike by remain workforce or an industrial dispute.

b. Facts also suggest that products P-102 and P-104 are labour intensive (due to high comparative high labour cost). Hence, even the spare capacity on account of out-sourcing of P-102 and P-104 is used, and then also some of the labour forces need to be retrenched.

Issue 3

Even if lay-off is accepted by workforce, then also cost associated with redundancies may be critical. Such cost is relevant for decision-making, hence should be considered.

Issue 4

Since the MSMF has no experience in the outsourcing till now, hence while dealing with Protease, MSMF need to ensure;

a. Timely delivery in right quantity
b. Quality of supplies
c. Penalties in case of default

(ii) Gain Sharing Arrangement by MSMF as part of outsourcing agreement with Protease Gain Sharing Arrangement is a contractual arrangement where, entity (MSMF) &outsourcing supplier (In this case protease) share the financial gain which result out of either productivity gains or increased efficiency at end of outsourcing supplier from continuous improvement, transformation, or innovation.

This arrangement in form of clause is usually included in Master Agreement of outsourcing. Outsource supplier find it unique selling point and entity is also on for continuous improvement apart this both will get share in cost saved.

Although gain sharing arrangement is largely useful in case of outsourcing services agreement, but MSMF can also while entering out-sourcing contract with Protease for P-102 and P-104; but following aspects need to be considered.

Reason of failure of Gain Sharing Arrangement - Gain Sharing Arrangement sounds great but in practice it is quite difficult to execute. Even after a considerable level of efforts due to following reasons it may fail :

a. Unstructured/Poorly structured terms of arrangement, in outsourcing contracts.
b. Error in implementation.
c. Relationship between outsource supplier and entity.

Precaution need to be taken - Action plan for executing gain share arrangement must contain :

a. Be specific in outsourcing agreement.
b. Predefined formula for sharing of benefits and period thereof.
c. Effort from entity, because innovation is not only responsibility of outsource supplier.
d. Constitute innovation team to create an innovation structure, generate the idea and execution of same.

Overall

In consideration of above analysis, company should consider the outsourcing of P-102 and P-104 by entering out-sourcing contract with Protease. At this point, it is important to note that cost analysis emphasizes purely quantitative, financial considerations.

However, outsourcing decisions are often influenced by qualitative factors, which are not directly affected in calculations. The impact of the same should also be taken into consideration. The issues suggested above are not exhaustive. Further, before opting gain sharing arrangement, the same should also be reviewed carefully from a business, legal, and tax perspective.

I hope this helps - if you need any further information, please let me know.

Closure of Report

Mr. Singh,
Management Accountant
(For Management Accounting Division)
Mount Sports Manufacturing Facilities (MSMF)

Question 25 : Case Study : [ICAI Module]

Star Limited is in the business of manufacturing copper rods. The copper rods are sold to various cable wire manufacturers across the country. The growth in economy, especially the power sector, has led to a sharp increase in demand of cable wires and copper rods. The company is considering an opportunity to set up its own copper wire manufacturing plant and gain a share of cable wire's market. A detailed study was carried out to understand the market of cable wires, market growth, competitive landscape, financial feasibility etc. The Chairman has asked the Director of Finance to review the financial feasibility study and highlight concerns, if any.

The following paragraphs contain summarised information of financial study carried out:

- The project of setting up a new cable wire manufacturing plant is expected to yield a Net Present Value of ₹ 200 crores considering a project life of 20 years. The initial cost of setting up the plant is ₹ 500 crores which is readily available with the company. The project would yield an IRR of 17.5% which is higher than the IRR of other plants under operation.
- The plant would employ about 70% of labour on contractual basis. These labours would mostly comprise immigrants from neighbouring countries. The feasibility study has assumed that the immigrant labours would be paid 15% less wage than that paid to other workers. However, the wage paid to immigrants would still be higher than the minimum wage requirements. The contribution to retirement funds is also not considered in the project evaluation. The company feels that immigrant workers would not stay beyond a period of a year and thus there is no requirement to contribute to retirement funds.
- The existing plants of the company do not have free space available and hence the company will need to buy land adjacent to its existing plant. A part of the proposed land to be acquired falls under the forest reserve area where no commercial activity is allowed. The company officials are in liaison with the government officials to get the land parcel approved. A certain percentage of the value of land would be paid to certain government officials through a consultant. This cost is not a part of the project evaluation report.
- The new plant would also produce certain chemically harmful waste which would be disposed off into a nearby river after treatment. The company however does not have any technology to treat the waste fully. A new treatment plant would cost about ₹100 crores.

The finance director has forwarded the entire report to you for comments.

Required :

(i) LIST various non-financial and ethical considerations in decision making.

(ii) EVALUATE the impact of the various issues in the financial study and give your RECOMMENDATION.

Solution 25 :

Issue

Star Limited manufactures copper rods and is considering commencing a new plant for manufacturing of cable wire. A financial evaluation has been carried out and the project appears to be financially viable. The project has a positive NPV of ₹200 crores and an IRR of 17.5%. Though the project is financial viable, there are certain concerns relating to the project.

Non-Financial and Ethical Consideration in Decision Making

Capital Budgeting or Investments decisions are generally made based on the various financial evaluation like Net Present Value, Internal Rate of Return, Payback Period etc. The financial considerations in capital budgeting decisions are important because the end objective of every profit making business is maximisation of shareholders wealth. However, an important aspect of capital budgeting is that investment decisions cannot be purely based on financial analysis. There are other soft non-financial aspects of the investment appraisal that need to be thoroughly looked into. Some of the non-financial considerations that a company should consider in investment decisions are listed below :

Environmental Factors

Environmental factors like pollution, deforestation, impact on climate and weather, greenhouse effects etc. must be considered by companies while selecting a project for implementation. Any project which adversely affects the environment is not taken positively by common public and environmentalists. A lot of projects have been stalled or delayed due to the protests by pro-environment groups leading to cost and time overrun. The government through ministry of environment could impose penalties on projects which are violating environmental norms or green norms.

Staff Motivation

Staff motivation and satisfaction is another important factor which companies might consider while choosing projects. If, for example, a company decides to implement automation in its plants for operations which would result in redundancy in labour, the overall staff motivation would come down. Staff and workers would resort to strikes and protest against such decisions. The company should adopt a participative approach while taking such decisions considering the impact it would have on the labours.

Government Regulations

The companies must comply with relevant government regulations while implementing projects. Some projects might be profitable and yield excellent returns. However, if the profits and cashflows are generated by violating government regulations, it could be harmful in the longer run for the company and its brand. The companies must ensure that all relevant laws and regulations are complied with.

Availability of Resources

The evaluation of any project must also consider availability of key resources like raw material, manpower, logistics infrastructure, electricity etc. If there is any constraint on any of the key resources at a future date, a financially viable and excellent project could well turn into a failed project. It is thus important that the requirements and availability of key resources are analysed in advance.

Availability of Project Site

Site selection involves measuring the needs of a new project against the merits of potential locations. This indicates the practice of new facility location, keeping in mind project requirements. A wrong or unsuitable project location may affect the very benefits of a financially lucrative investment proposal.

Corporate Social Responsibility

Corporate social responsibility refers to "the ethical principle that an organisation should be responsible for how its behaviour might affect society and the environment". The companies do not function in silos but are a part of the larger society and environment. They have a responsibility towards the society and environment to use the various resources judiciously and ensure a sustainable development. Companies are expected to uplift the well being of the society at large and to not harm the environment through operations. The aspects of corporate social responsibility must also be considered while deciding the project to be implemented.

Ethics

Ethics are a set of guiding moral principles for individuals and corporates. Every company has a duty of care to various stakeholders (shareholders, employees, suppliers, customers etc.). A company is expected to act in a fair and transparent manner and be honest in all its dealings with stakeholders.

Issues involved in the Financial Study of Star Ltd.

As discussed earlier, the project is financial viable with a very good NPV and IRR. The amount required to build the plant is also available with the company. Financially, the project must be accepted. However, there are certain non-financial issues which must be addressed before a decision to build the plant is taken.

Payment to Labour and Ethics

As explained earlier, every company has a duty of care to all its stakeholders and the stakeholders must be treated fairly. Labours are a key stakeholder for the construction and running of the plant. The company has chosen to pay 15% lower wage to immigrant workers and not contribute anything towards their retirement benefits.

The company is paying a higher wage to the labours than required by law and hence there is nothing illegal in such payments. However, the company must not discriminate between workers who are doing same nature of work just because the workers are immigrants. The reputation of the company might be affected because of the lower wages paid to immigrants. There is a possibility that these labours go on protests and strikes or decide not to work for the company.

The company has also decided not to contribute to retirement funds for these workers. This could have a legal implication as well. The financial impact of paying wages at par with other workers and contributing to the retirement fund for immigrant workers is not known. However, the company should reconsider this decision and pay all the workers the same level of wages. The company should also contribute to the retirement fund of employees.

Availability of land and bribery

The existing plant does not have sufficient space to build a new plant and hence the company is planning to acquire additional land which falls under the forest reserve area where no commercial activity is allowed. The company is in liaison with government officials to get the land acquisition approved. The company would also be paying bribes indirectly to the government officials to get the land allotment approved.

The payment of bribes to government officials, whether directly or indirectly would be unethical. The company could face litigation for acquiring land by unfair means and in future, there is a possibility of such allotments being cancelled. The company's reputation would also be dented if

news of bribery is published by the media. The company also has a responsibility towards the environment and must contribute towards a sustainable development. The society at large would not take acquisition of forest land by unfair means positively. This will impact the overall goodwill and brand image of the company.

The company must evaluate if land at other sites can be acquired for construction of the plant. Such acquisition would be at a higher cost but would be beneficial to the company in the longer run.

Chemical waste and technology

The proposed plant is likely to emit chemically harmful waste which would pollute the environment. The technology available with the company can treat such waste partially. The company has to incur an additional cost of ₹100 crores to build a new treatment plant. This means that the NPV of the project would be reduced by ₹100 crores and IRR would also be lesser if the new treatment plant is built.

As discussed earlier, the company must operate in a socially responsible manner and consider implication of its action on the environment. The pollution caused by plants affects the surrounding environment and might lead to protests by local residents. Sometimes such protests are backed by NGOs as well. The commissioning of environmentally sensitive projects is difficult at times and can cause project delays as well.

The company should consider acquiring a new chemical waste treatment plant to ensure that there is no discharge of harmful waste from the company's plant. Though, there is an additional cost involved in building a new plant, it is important that the society at large perceives that the company is operating in a socially responsible manner. The company operates in a society and is an integral part of it and hence, it has certain responsibilities towards the society as well.

Conclusion

The ultimate objective of a company is to maximise shareholders wealth. The company must, however, operate in a socially responsible manner in achieving the objective of wealth maximisation. The company has a duty of care to other stakeholders like employees, society at large etc. In some cases, there may be conflict between different stakeholder's objectives. For instance, a new waste treatment plant would be good for the environment and society at large but would be adverse for shareholders as an additional cost of ₹100 crores would be incurred. The company must definitely consider non-financial factors along with financial factors while deciding on whether to build a new plant or not.

Question 26 : [Case Scenario – RTP Nov. 2019]

Sprinter Sportswear is a multi-national company which has a market presence in 23 countries. Yet, the company does not own even a single factory. Production has been entirely outsourced to 175 factories located in places where cost of operations is low. Factories cater entirely to Sprinter's procurement demands. These factories operate independently, Sprinter plays no role in their operations. Procurements from these suppliers network is stored at distribution centers from where dispatches are made to wholesalers of sportswear and apparel.

Recent news reports from some of the Third World foreign countries have indicated that there is a high child labor employment. Child Labor although against the law in these countries is resorted in order to keep cost of operations low. Factories in these countries do not directly employ children. Instead they subcontract the work to contractors. These contractors in turn hire children illegally without the local knowledge of local law enforcement authorities. In addition, working conditions in these factories are very unhygienic and oppressive.

Sprinter initially turned a blind eye to this problem, since it only acts as a customer of these factories. Sprinter, as a company, has done nothing illegal as a part of company operations. However, increased focus given to corporate social responsibility, has forced the Board members to consider taking action against such factories.

Required :

(i) DISCUSS why Sprinter sportswear should attempt to address this issue.

(ii) SUGGEST some of the actions that the company can take to address this issue.

Answer 26 :

(i) Work can be outsourced to countries on the other side of the globe, in order to achieve low cost advantage. A company may not be directly responsible for faulty practices of its suppliers. However, modern organizations have a moral duty of care to a wider range of stakeholders who may not directly be related to the company. In this case, it owes a duty of care towards employees hired by factories within its supply chain. The issue it is dealing with relates to exploitation of child workers by factories, perpetrated by sub-contracting work to third party contractors. While Sprinter sportswear has not done anything illegal, it owes moral responsibility towards these children. Children have a right to education, because of which child labor is illegal in most countries. Since children are employed directly on account of the work that has been outsourced. Sprinter should attempt to address this issue. Also, any negative news about how its products are made, could impact its business.

(ii) Sprinter should aim to make its products responsibly. Some actions it can take are :

- Sprinter can develop a Code of Conduct that details the acceptable standards of conducting business. These standards could relate to hiring practices of which it can specify that workers should be above a particular age to be employed for manufacturing a product. Others could relate to workplace environment, safety, and environment sustainability. Sprinter should insist that suppliers implement these Codes of Conduct along with other compliances with laws. It should insist that the supplier be open to periodic inspection by Sprinter to ensure compliance with standards as per its Code.

- Sprinter can set up an audit team that regularly audits factories on the pre-sourcing and follow-up stages. Sprinter should do business only with those factories that are complying with its standards. Any offenders to the Code of Conduct in the follow-up stages, should be held liable to penalty or termination of contract for serious offenses.

- Sprinter can list on its website, location wise suppliers from whom it procures its products. It can even give information about products made by each of its suppliers, average age of workers, worker diversity etc. This will enable watch groups to know who the suppliers are and warn the company if there are any child labour issues within these factories.

Question 27 : [RTP Nov. 2020 + Case Study Digest of ICAI]

ABC Limited specializes in the manufacture of chemical intermediaries in a very competitive business environment. ABC is a public listed company, with majority of its shareholders being institutional investors like mutual funds, banks and insurance companies.

It is located in a water scarce zone in Tamil Nadu. There are restrictions on the tapping and usage of groundwater under the relevant laws. Penal provisions of the law will apply in case of violations. The production process requires water and the amount of water that the company can draw is limited to 19,000 kilo-litres (1 kilo-litre is 1,000 litres). Purchase of water is not an option as availability is highly erratic and exorbitant on cost.

The company manufactures two types of chemicals "A" and "B" and these are sold in kilograms. The company is in the process of making the business plan for the year 2021.

Based on the actual operating data for 2020 and taking into consideration the inflation and possible price increases that it can obtain from the market, the following product costing details have been arrived at:

Particulars	A	B
Capacity Volume kg. (not inter-changeable)	8,25,000	9,30,000
Selling Price per kg.	₹ 2,000	₹ 1,000
Variable Cost per kg.	₹ 1,500	₹ 650
Water (litre/ kg.)	12.5	10

Under the relevant income tax laws prevalent, companies with a turnover of ₹ 250 Cr. (Crores) or less are taxed at a lower rate of 25% as against the normal 30%. The company intends to keep its sales for 2021 equal to ₹ 250 Cr. or slightly lesser to avail this concessional income tax benefit.

With capacity constraints, the company has calculated that it would be still beneficial for the company to stick to ₹ 250 Cr. as only a marginal increase in turnover is possible over ₹ 250 Cr. If we cross 250 cr. Then due to higher tax @ 30%, the PAT would be still lower than the PAT arrived at after doing just ₹ 250 Cr. and availing the lower income tax rate.

CFO asked management consultant to work out the volumes in kg. of products "A" and "B" which would give an optimal (maximum) contribution given the constraints on capacity, water usage and turnover to avail the concessional income tax benefit.

Consultant works out the following product mix using Linear Programming. She also proposes another mix which does not meet the constraint on water usage where the company could end up drawing excess water than permitted by 113 kilo-litres but would result in an increase of ₹ 30 lakhs in contribution. She says that it is easily possible to do this by managing reporting to the water authorities.

Product		Optimal	Suggested
A (Volume in kg.)		8,00,000	7,85,000
B (Volume in kg.)		9,00,000	9,30,000
Contribution in ₹ Cr.		71.5	71.8
	Constraints		
Sales	<= 250 Cr.	250	250
Volume of "A" in kg.	<= 8,25,000	8,00,000	7,85,000
Volume of "B" in kg.	<= 9,30,000	9,00,000	9,30,000
Water usage (in KL)	<= 19,000	19,000	19,113

Required :

The CFO is not satisfied with the calculations. He wants you (Sr. Finance Manager) to come up with a proper DISCUSSION.

Answer 27 :

Primary goal of investor owned firms is shareholders wealth maximisation, which translate to stock price maximisation. Management Consultant's plan is looking good for the ABC as there is a positive impact on the profitability (₹ 30 lacs) of the company. Also, ABC operates in a competitive environment so for its survival, it has to work on plans like above.

There is another side of the coin that cannot be ignored i.e. **business ethics**. It is easily possible to manage drawing of excess water, but it is not an ethical practice as the company has responsibilities towards use of natural resources like water and protecting the environment.

Besides, a whistle-blower complaint to the water authorities can land the company into trouble in terms of penalties. If will have adverse financial impact and also such penalties are disallowed for income tax purposes. It is possible that such a violation may be reported in the media causing disrepute to the name of the company. It can also make investors in the share market stay away from the company as it has ethical governance issues. The company will face challenges in obtaining other government approvals when it will plan expansion as this violation may have to be reported on the applications seeking approvals.

Overall

May be ABC would be able to earn higher profit due to this plan in short run but it will tarnish the image of the ABC which would hurt profitability in long run. Therefore, before taking any decision on this plan, ABC should analyse both qualitative and qualitative factors.

Question 28 : [RTP Nov. 2020 + Case Study Digest of ICAI]

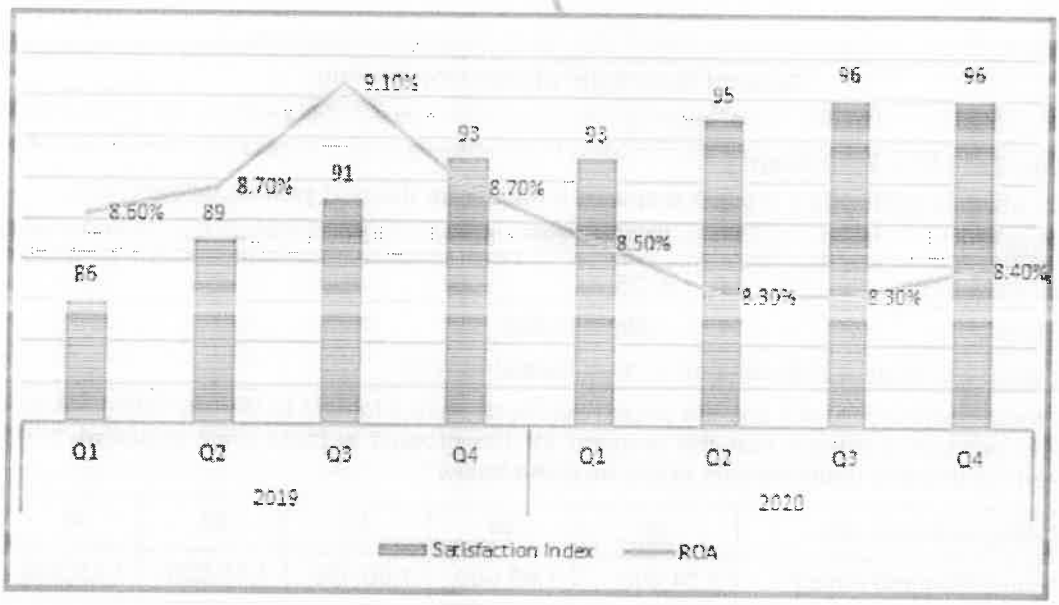
Kristin LLP sells wide range of household products. The firm has recently received few negative feedbacks about the product and customer services. CEO is not happy with this. As per the opinion of CEO –

"Nowadays when social medial play such an important role in making decision, its crucial to keep an eye on the quality of customer service you provide. If you don't care about customers' satisfaction, don't expect them to care about your services or products. When customer share their story, they're not just sharing their problems. They are actually teaching you how to make your product, service, and business better."

There has been considerable discussion at the corporate level as to improve 'Customer Satisfaction'. Convinced with this logic, firm has invested heavily in customer satisfaction and adopted the following plan of action –

- Providing helpline 24/7 in order to develop personal relationship with customer;
- Redesign its online platform in order to make it more customer friendly;
- Rewarding loyal customers by giving them experience, they would not forget for life; and
- Ease the return and refund policy, offering no questions asked, as a smart move over competitors.

The CEO was initially delighted to see that their efforts pay off in the form of higher customer satisfaction score index, however he is anxious to see the corresponding financial results. It is shown in the graph below :



Required :

After the seeming lack of improvement in financial performance with customer satisfaction, should Kristen LLP stop investing in a superior customer experience? DISCUSS.

Answer 28 :

In this case we can see that there are two considerable sides of the question; one is customer satisfaction and another one is profitability. By adopting the proposed plans, firm has managed to get higher customer satisfaction score card and it is expected that with higher customer satisfaction, the firm's financial result will improve i.e. increase in ROA. However, increasing the customer satisfaction is costly. Plans which are used to increase customer satisfaction will increase the cost of the firm. This additional cost will weaken the firm's ROA by lowing profit and increasing the asset base. The optimum level of customer satisfaction is where the incremental benefits are equal to incremental costs of increasing satisfaction.

While observing the pattern of data, the customer satisfaction has increased from 86 points to 91 points in first three quarters of 2019. At this level, the additional benefits seem to more significant than the additional cost. However, in subsequent quarters, additional cost has increased more rapidly than the additional benefits. Therefore, there is decrease in ROA as we move forward on the index. However, toward the end of 2020, we see a marginal increase in ROA. This is due to the **lead-lag relation** between satisfaction and ROA. It means, the increased satisfaction might take some more time, some more quarters to result in higher ROA and the relation might not be linear. However, toward the end of 2020, the customer satisfaction score stabilizes at 96 points levels.

Overall, Kristin should not stop investing in superior customer experience, the lack of apparent pattern in customer satisfaction and profitability could stem from several causes as discussed above. Instead, firm should take decision considering current satisfaction levels, the incremental cost of increased satisfaction, and perception of the increased benefit. Moreover, the firm should also consider the current sales, otherwise it might lose its share to competitor if they do nothing.

General Questions of Decision Making

Question 29 : [May 2019 Exam]

RK Ltd., which is producing a product prepared a budget for the next year as follows:

Fixed Cost p.a.	₹ 12,60,000
Variable Cost p.u.	₹ 25
Production	1,80,000 units

Selling price – Cost plus 25% mark up on total budgeted cost.

When these budgeted figures and the pricing approach were informed to the Marketing Manager, he came out with a remark that the demand for the product is more price sensitive and he expected the demand under various prices as given below :

Selling Price p.u. (₹)	36	38	40	42	44
Annual Demand (units)	1,74,000	1,62,000	1,50,000	1,38,000	1,25,000

The Marketing Manager further informed that a wholesale dealer is ready to buy the entire production of the company at a price of ₹ 32 p.u. In that situation he expected a savings of ₹ 2 p.u. in the selling expenses which are a part in the above stated variable cost.

Required :

EVALUATE the situation and advice the most profitable course of action. **(10 Marks)**

Answer 29 :

The company has a plan to produce 1,80,000 units and it proposed to adopt Cost plus Pricing approach with a markup of 25% on full budgeted cost. To achieve this pricing policy, the company has to sell its product at the price calculated below :

Quantity to be sold	1,80,000 units
Total Variable Cost (1,80,000 units x ₹ 25)	₹ 45,00,000
Add : Fixed Cost	₹ 12,60,000
∴ Total Budgeted Cost	₹ 57,60,000
Add : Profit (25% of ₹ 57,60,000)	₹ 14,40,000
∴ Total Revenue (need to earn)	₹ 72,00,000
Selling Price per Unit [₹ 72,00,000 / 1,80,000 units]	₹ 40 p.u.

However, at selling price ₹ 40 per unit, the company can sell 1,50,000 units only, which is 30,000 units less than the budgeted production units.

After analyzing the price-demand pattern in the market (which is price sensitive), to sell all the budgeted units market price needs to be further lowered, which might be lower than the total cost of production.

Statement Showing "Profit at Different Demand & Price Levels"

Particulars	I	II	III	IV	V	Dealer
Demand (Units)	1,74,000	1,62,000	1,50,000	1,38,000	1,25,000	1,80,000
Capacity used (%)	96.67%	90.00%	83.33%	76.67%	69.44%	100%
	₹	₹	₹	₹	₹	₹
Selling Price p.u.	36	38	40	42	44	32
Variable cost p.u.	25	25	25	25	25	23
Contribution p.u.	11	13	15	17	19	9
Total Contribution	19,14,000	21,06,000	22,50,000	23,46,000	23,75,000	16,20,000

Advice :

(i) Taking the above calculation and analysis into account, the company should produce and sell 1,25,000 units (i.e. near to 70% of budgeted production) at ₹ 44 per unit. At this price RK can earn maximum contribution and profit as compared to other options.

(ii) Sell to wholesale dealer is not a financially viable option. Instead RK may explore other opportunities to utilize additional capacity i.e. 30%. For example, international expansion through e-commerce website or outsource the unutilized capacity to others to earn additional revenue.

Question 30 : [RTP – Nov. 2019]

N2 Co. is the manufacturer and supplier of fire fighting and safety equipment for industrial use and follows the international quality standards and uses the high grade raw material. It is a fast-growing brand that protects millions of people across India. N2 has been offered a bid on a prospective export contract for 20,000 commercial fire extinguishers with following specification from USA buyer and the delivery terms is FOB.

"two-gallon cylinder holding 10 pounds of multi-purpose dry chemical at 380 PSI".

N2 is exporting first time. The price computation per fire extinguisher is as follows:

Particulars	₹	₹
Direct Material :		
Circle Part Cost	620	
Necking Part	30	
Bottom Part	50	
Fire Extinguisher Powder	590	
Heat Process	50	
Nozzle	60	
Meter	20	
Pipe	50	
Nitrogen	30	1,500
Direct Labour (2 hrs. x Rs. 40)		80
Leakage Testing		50
Variable Overheads (including packing)		214
Export Clearance Charges on FOB term		36
Fixed Overhead		100
Total		1,980
Add: Mark up @ 10%		198
Price		2,178
USD to INR		67
Price in USD		**32.51**

After quotation of USD 32.51, the buyer is negotiating the price and ready to pay only USD 28.50.

Required :

ADVISE whether it is worth accepting at USD 28.50 considering other factors.

Answer 30 :

Statement Showing Benefit from Prospective Export Contract :

Particulars	Amount
Direct Material	1,500
Direct Labour (2 hrs x ₹ 40)	80
Leakage Testing	50
Variable Overheads (including packing)	214
Export Clearance Charges on FOB term	36
Total Relevant Cost	₹ 1,880
USD to INR	₹ 67
Relevant Cost	$ 28.06
Price Offered by Customer	$ 28.50
Benefit per extinguisher	$ 0.44
No. of extinguishers	20,000
Total Benefit	$ 8,800

Advise :

From financial perspective, it will be profitable for N2 to accept the contract because of gain of $8,800 (i.e. ₹ 5,89,600 approx). N2 may get some export incentives or duty drawback also. Besides this, following consideration should also be taken into consideration while exporting fire extinguishers.

Statutory Compliance

Before exporting to a foreign country or even agreeing to sell to a new customer in a foreign country, N2 should be aware of foreign laws that might affect the sale. Export documentation is important as it plays a significant role in regulating the flow and movement of goods in international markets. Each country has its own prescribed statutory documents to be complied by exporters and importers. Thus, N2 should consider about the documentation and inspection compliance part of new buyer. It may include third party audit, commercial invoice and packaging list requirements, certificate requirements like – no child labour certificate, inspection certificate, reach compliance certificate etc. If any compliance requirement is not met, what will be the consequences? There may be stiff penalty to be paid owing to non-compliance or failure to accurately comply with the export obligation.

Buyer Credit worthiness

It is necessary that before shipment, the exporter to carry out its own credit check on the importer to determine credit worthiness. Thus, N2 should make a proper assessment of the credit worthiness of the foreign buyer and spend sufficient time in cross checking the credit worthiness of his counterpart to avoid any kind of unforeseen situation in future. Such information can be easily availed through contacts or through ECGC. Private agencies also provide information on paid service basis. However, this risk can be covered by asking for LC payment terms or 100% advance or opting for post shipment insurance for goods being exported.

Industry Analysis

Industry analysis involves such things as assessing the competition in the industry, the interplay of supply and demand in the industry; how the industry holds up against other industries that are emerging and providing competitions, the likely future of the industry, especially in light of

technological developments; how credit works in the industry; and the exact extent of the impact that external factors have on the industry.

For N2, it is worthwhile to know the current and future demand of fire extinguisher and factors influencing the growth of global fire extinguisher market. N2 can perform industry analysis through three main ways i.e. the Competitive Forces Model (also known as Porter's 5 Forces); the broad factors analysis, also known as PEST analysis; and SWOT analysis. It may also arrange industry report from trusted sources.

Additional Terms

Ensure that the all terms are clear and suit the business purpose. For instance, delivery terms should provide date of shipment or means of determining the date. In some circumstances, a late delivery penalty may be incurred where goods are not supplied by a specific delivery date. Therefore, N2 should evaluate whether shipment date is attainable or not. If the target shipment date could not be met, what will be the charges? Further, N2 must also check whether the foreign bank charges are subject to beneficiary account. If yes, then the same must be considered in the quotation.

Overall, N2 should accept the proposed contract only after due and careful consideration of the above factors.

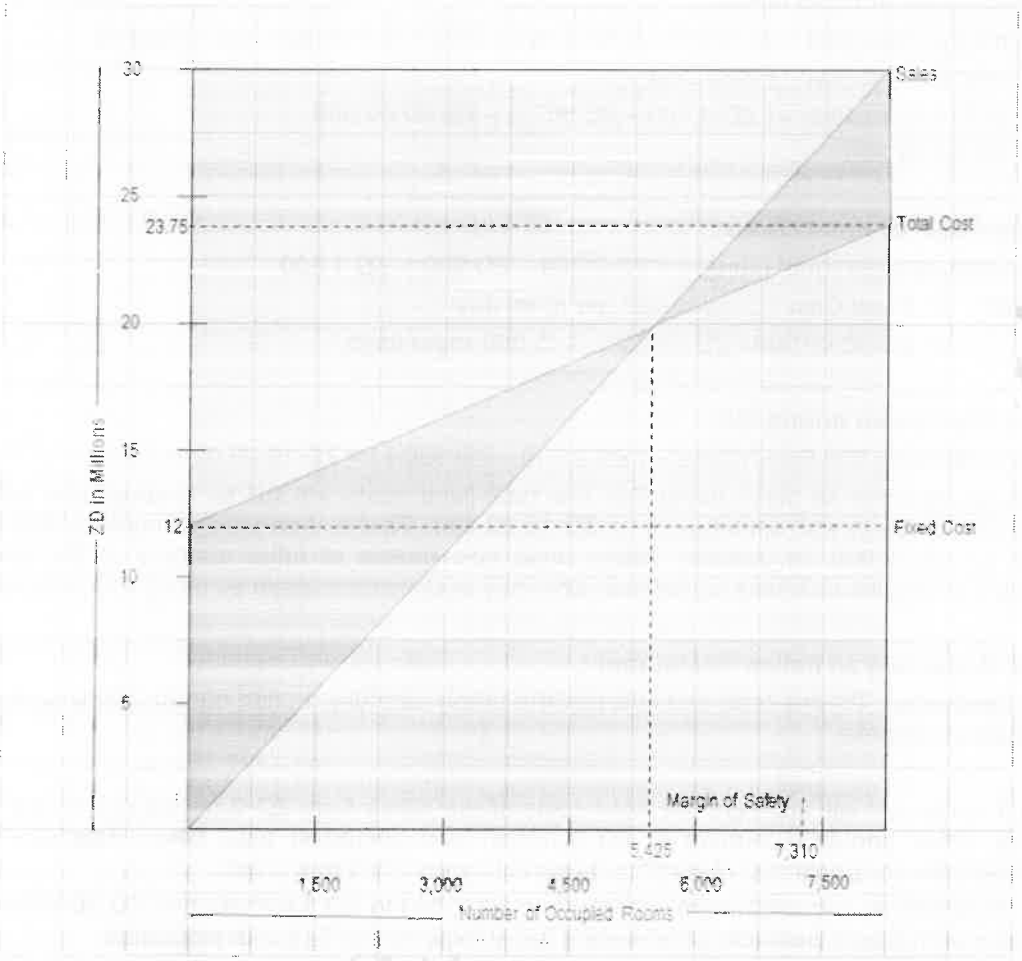
Question 31 : [RTP – Nov. 2019]

Hotel Nikko, Zeeland, an affordable leisure hotel resort is an ideal retreat to escape, unwind and enjoy peace of mind. Set amid expansive tropical greenery in the enclave of Zeeland, Hotel Nikko is designed for pleasure, where services reign supreme and Italian-style architecture of its 25 classic rooms harmonize with nature. Hotel Nikko, Zeeland is a beachfront resort that features a good choice of swim-up pool bar, gym, and variety of restaurants. A wide array of water sport activities like surfing, sailing, jet skiing etc. are available from beach operators at walking distance. The hotel is synonymous with enjoyment and value for money, with a large choice of very attractive "All Inclusive" packages.

Nikko charges guests ZD 2,700 per room per night, irrespective of single or double occupancy. The variable cost is ZD 900 per occupied room per night. The Nikko is available throughout 365 days a year and has a 75% budgeted occupancy rate. Fixed costs are budgeted at ZD 9 million and are incurred evenly during the year.

During the second quarter (Q2) of the year, usually the room occupancy rates remain substantially below the levels expected at other quarters of the year. Nikko is expecting to sell 900 occupied room nights during Q2. Management is considering strategy to improve profitability, including closing the Nikko for the duration of Q2 or adopting one possible option as follows –

There is scope to extend the Nikko by creating enough space to run a Rustic Chic, Italian Style restaurant to serve its guests. The annual revenues, costs and sales volumes for the **combined** operations are given in the following graph -



Note : Zeeland's home currency is the ZD

Required : ANALYZE the profit improvement plan.

Answer 31 :

The Present Profit of Hotel Nikko :

Total Room Days Occupied = 25 Rooms x 365 Days x 75% = 6,844 room days (approx)

Profit = Total Contribution – Fixed Cost

= [6,844 room days x (ZD 2,700 – ZD 900)] – ZD 90,00,000

= ZD 33,19,200

The Present BEP of Hotel Nikko :

Present contribution per room per day = ZD 2,700 – ZD 900 = ZD 1,800

Present BEP = Fixed Cost / Contribution per room day

= ZD 90,00,000 / ZD 1,800 = 5,000 room days

If Nikko is Shut Down during Q2 :

Loss of Contribution [900 Room Days x (ZD 2,700 – ZD 900)] = ZD 16,20,000

Nikko should not close its hotel during Q2. The total fixed costs will still be incurred and hotel closure would result in lost contribution of ZD 16,20,000. This in turn would decrease annual profits by ZD 16,20,000. In addition, Nikko could lose guests at other quarters of the year, particularly their regular business customers, who may perceive the Nikko as being non-reliable.

Proposal of opening an Italian Restaurant :

Note for Students : Please read and interpret the graph carefully, to find out the following data in it for analysis purpose.

Opening a restaurant will increase the fixed costs of the Nikko from ZD 9 million p.a. to ZD 12 million p.a. Thus, annual increment of ZD 3 million is expected in fixed cost. This can be observed from the total cost line of combined operations provided in a graph.

Average Revenue per occupied room will rise from ZD 2,700 to ZD 3,636.36. (i.e. ZD 30 Million / 8,250 rooms from graph) because of increasing guest expenditure in Italian restaurant.

The total cost predicted at a level of 8,250 occupied rooms is ZD 23.75 million, which means the variable costs must be ZD 11.75 million (ZD 23.75 million – ZD 12 million fixed costs). This amounts to a variable cost per occupied room day as ZD 1,424.24 (i.e. ZD 11.75 Million / 8,250 room days). It is an increase of ZD 524.24 over the previous variable cost per room day (i.e. ZD 1,424.24 - ZD 900).

Consequently, the breakeven point has gone up from 5,000 to 5,425 (as shown in the diagram) occupied rooms. It means, Nikko is required to sell more room nights to recover extra costs. However, budgeted occupancy is now 7,310 occupied room nights which is 80.11% occupancy (i.e. 75% / 6,844 x 7,310). This provides a margin of safety of 1,885 occupied room nights (i.e. 7,310 - 5,425) or a MOS ratio of 25.79% (i.e. 1,885 / 7,310).

At 7,310 occupied room nights, Nikko's budgeted profit would be :

Profit = Total Contribution – Fixed Cost

= [7,310 room days x (ZD 3,636.36 – ZD 1,424.24)] – ZD 12,000,000

= ZD 41,70,597

It is more than present budgeted profit of ZD 33,19,200. The profit of Nikko will increase by ZD 8,51,397. Hence, it is advisable for Nikko to go for opening an Italian Restaurant.

Question 32 : [Nov. 2020 Exam - 10 Marks]

Student Note : I have noticed certain errors in the drafting of question by ICAI. Hence, I have made suitable modifications in the question & answer to make it understandable to you. Original question as drafted by ICAI may lead to multiple interpretations.

ZAINA Pvt. Ltd. is a manufacturing company of electrical equipment. The company is facing the possibility of a strike by its direct production workers engaged on the assembly of one of its machines. The Trade Union is demanding an increase of 8% in wages from the beginning of this financial year. The company expects that if a strike takes place, it will last for four weeks and after that the Union will settle for an increase of 6% wages from the beginning of this financial year.

Strike would affect the production of Ceiling Fans. Ceiling Fan is generally sold for ₹ 2,000 per unit, under the normal situation. The estimated cost for Ceiling Fan is :

Particulars	Fixed Cost (₹)	Variable Cost (₹)
Production cost	8,00,000 p.a.	1,200 per unit
Distribution cost	3,00,000 p.a.	80 per unit
Total cost	11,00,000 p.a.	1,280 per unit

Direct labour comprises 60% of the variable production cost. The budgeted output is 30,000 ceiling fans in 50 working weeks per year.

If the strike takes place, then the following situation is expected by the company :

(a) Maintenance staff whose wages are included in the fixed production costs, would be used to carry out an overhaul of the conveyor system using materials worth ₹ 50,000. This work would otherwise be undertaken by an outside contractor at a cost of ₹ 1,50,000 including material cost.

(b) Sales of 500 Ceiling Fans would be lost completely during strike period. The balance that could ordinarily have been produced during the strike period, would be produced in overtime working. During overtime, the workers' efficiency would be 80% of the normal and wages will have to be paid @ one and a half times of normal wages. Similarly, it would also involve an additional fixed cost of ₹ 40,000.

(c) Production during strike period would be sold to the distributors at a discount of 25% of its normal selling price.

Required :

(i) Calculate the profit or loss with and without strike.

(ii) Taking purely economic point of view, Advise the management on whether to allow the strike to go ahead or agree to the Union's demand.

(iii) List any two factors, not considered in your above evaluation, that may have an adverse impact for the company, if the strike were to take place.

Solution 32 :

Working Notes :

- Normal production per week = 30,000 units / 50 weeks = 600 units per week
- Production during strike period of 4 weeks = (600 units x 4 weeks) - 500 units = 1,900 units
- Production during remaining period of 46 weeks = (600 units x 46 weeks) = 27,600 units

- Selling price during strike period = ₹ 2,000 - 25% = ₹ 1,500 per unit
- Normal labour cost per unit = 60% x 1,200 = ₹ 720 per unit
- Variable cost (excluding labour) per unit = 40% x 1,200 = ₹ 480 per unit
- To avoid strike, we have to accept the demand of labour union for 8% increase in wages. In such case, the labour cost per unit shall be = ₹ 720 + 8% = ₹ 777.60 per unit
- If we don't accept their demand for 8% increase, then the workers will go on strike for around 4 weeks period, and then they will accept 6% increase in wages. In such case, the labour cost per unit shall be = ₹ 720 + 6% = ₹ 763.20 per unit
- Overtime wages during strike period at 80% efficiency = (₹ 763.20 x 1.5 times) / 80% = ₹ 1,431 per unit
- During strike period, our maintenance staff will carry out an overhaul of conveyor system and thereby it will save ₹ 1,50,000 after using material worth ₹ 50,000. Thus, the net savings due to strike shall be ₹ 1,00,000.
- Alternatively, the above matter of maintenance cost can be written as : (a) outside contractor cost of ₹ 1,50,000 without strike and (b) only material cost ₹ 50,000 if there is a strike. The net difference in cost shall remain ₹ 1,00,000 only. The wages of maintenance staff is already included in fixed production cost and hence it is not required to be considered separately again.

(i) Calculation of Profit / Loss with and without strike :

Particulars	No Strike (₹)	With Strike (₹)
(a) Sales Revenue during normal period	6,00,00,000 [30,000 units x ₹ 2,000]	5,52,00,000 [27,600 units x ₹ 2,000]
(b) Sales Revenue during strike period	--	28,50,000 [1,900 units x ₹ 1,500]
(c) Total Revenue / Benefit [a + b]	6,00,00,000	5,80,50,000
(d) Variable production cost excluding labour cost	1,44,00,000 [30,000 units x ₹ 480]	1,41,60,000 [29,500 units x ₹ 480]
(e) Labour cost for normal production	2,33,28,000 [30,000 units x ₹ 777.6]	2,10,64,320 [27,600 units x ₹ 763.20]
(f) Overtime wages for strike period	--	27,18,900 [1,900 units x ₹ 1,431]
(g) Additional fixed labour cost	--	40,000
(h) Maintenance cost	1,50,000	50,000
(i) Variable distribution cost	24,00,000 [30,000 units x ₹ 80]	23,60,000 [29,500 units x ₹ 80]
(j) Total Fixed cost	11,00,000	11,00,000
(k) Total cost [d to j]	4,13,78,000	4,14,93,220
(l) Profit / Loss [c - k]	1,86,22,000	1,65,56,780
(m) Decrease in profit [Diff.]		20,65,220

(ii) Advise based on financial view :

The total profit without strike is higher than with strike. If the workers go on strike, then the profit reduces by ₹ 20,65,220. Hence, on purely economic point of view, we should accept the demand of labour union by 8% increase in wages since beginning of this year and avoid strike.

Student Note : The above calculation is done for a year only. However, labour cost may be saved in future years also. ICAI has ignored this point in absence of such information.

(iii) Other factors having adverse impact of strike :

- Loss of company's goodwill due to strike
- Impact on the future performance of workers, who go on strike
- Strained relationship between trade union and management
- Customers may move away to other competitors during strike period
- Other workers may also go on strike to support the present workers
- Strike may continue for a longer period than expected

Use of Quantitative Techniques in Decision Making - LPP

PROBLEM 33 :

A Company produces two products X and Y, each of which requires three types of processing. The length of time for processing each unit and profit per unit are given in the following table:

Particulars	Product X (hr/unit)	Product Y (hr/unit)	Available capacity per day (hr.)
Process I	12	12	840
Process II	3	6	300
Process III	8	4	480
Profit per unit	50	70	

How many units of each product should the company produce per day in order to maximize the profit? Also calculate the maximum profit.

Solution 33 :

Optimum Quantity of Product X = 40 units and Product Y = 30 units.

Maximum profit = Rs. 4,100

PROBLEM 34 :

A Ltd. makes 2 products, Tables and Chairs, which must be processed through Assembly and Finishing departments. Assembly has 60 hours available per week; finishing can handle up to 48 hours a week.

Manufacture of one table requires 4 hours of assembly and 2 hours in finishing. Each Chair requires 2 hours in assembly and 4 hours in finishing. Profit is Rs. 800 per table and Rs. 600 per chair. Choose the best combination of chairs and tables to be produced to maximize the profit.

(i) Formulate the Linear programming model equations

(ii) Present & Solve Graphically

(iii) What is the maximum profit

Solution 34 :

Key Data :

Particulars	Tables	Chairs	Resources
Assembly hours	4 hrs.	2 hrs.	60 hours/week
Finishing hours	2 hrs.	4 hrs.	48 hours/week
Profit per unit (₹)	800	600	

Optimum Quantity of Tables = 12 units and Chairs = 6 units per week.

Maximum profit = Rs. 13,200 per week.

* * * * *

7 PRICING DECISION

PROBLEM NO. 1 :

R Ltd. has spare capacity in two of its manufacturing departments - Department 4 and Department 5. A five day week of 40 hours is worked, but there is only enough internal work for 3 days per week so that 2 days per week (16 hours) could be available in each department. R Ltd. has sold this time to another manufacturer, but there is some concern about the profitability of this work.

The accountant has prepared a table giving the hourly operating cost in each department The summarised figures are as follows:

Particulars	Dept. 4	Dept. 5
	Rs.	Rs.
Power costs	40	60
Labour costs	40	20
Overhead costs	40	40
Total cost	120	120

The labour is paid on a time basis and there is no change in the weekly wage bill whether or not the plant is working at full capacity. The overhead figures are based on firm's current overhead absorption rates (fixed and variable) when the departments are operating at 90% of full capacity (assume a 50 weeks year). The budgeted fixed overhead attributed to department 4 is Rs. 36,000 p.a. and that for department 5 is Rs. 50,400 p.a.

As a short term measure the company has been selling processing time to another manufacturer @ Rs. 70 per hour in either department. The customer is willing to continue this arrangement and to purchase any spare time available, but R Ltd. is considering the introduction of a new product on a minor scale to absorb the spare capacity.

Each unit of the new product would require 45 minutes in Deptt. 4 and 20 minutes in Deptt. 5. The variable cost of the required input material is Rs. 10 per unit. The market study indicated as follows :

(i) With a selling price of Rs. 100, the demand would be 1,500 units p.a.

(ii) with a selling price of Rs. 110, The demand would be 1000 units p.a.

(iii) with a selling price of Rs. 120, the demand would be 500 units p.a.

You are required to calculate the best weekly programme for the spare time in the two manufacturing departments, to determine the best price to charge for the new product and to quantify the weekly gain that this programme and price should yield.

ANSWER 1 :

The relevant cost of producing the new product is the variable cost plus the lost contribution from selling the processing time to another manufacturer. It is given that, the main product will absorb 3 days per week.

Calculation of variable overhead rates & variable cost per hour

SN	Particulars	Dept. 4	Dept. 5
(a)	Normal Hours per annum (40 hrs. per week x 50 weeks x 90%)	1,800 hrs.	1,800 hrs.
(b)	Fixed Overheads (given) Rs.	36,000	50,400
(c)	Fixed O.H. Rate / Hr. (Rs.) [b / a]	20	28
(d)	Total O.H. Rate / Hr. (given) Rs.	40	40
(e)	Variable OH Rate /Hr. (Rs.) [d – c]	20	12
(f)	Power costs per hour (given)	40	60
(g)	Total variable cost per hour [e + f]	60	72

Note : Labour cost is fixed (given), hence ignored from the above table.

If the new product is not developed, dept. 4 shall sell unused processing time at Rs. 70 per hour, thereby gaining additional contribution of Rs. 10 per hour (70 – 60). However, it is not profitable for Dept. 5 to sell processing time at Rs. 70 per hour since the variable cost is more at Rs. 72.

If we use the, the unused time of these departments for manufacturing a new product, then the relevant cost per processing hour shall be :

Dept. 4 = Rs. 70 (Rs. 60 variable cost + Rs. 10 opportunity cost due to lost contribution)

Dept 5 = Rs. 72 (i.e. variable cost)

Relevant cost for producing the new product

Particulars	**Rs.**
Direct Material (Given)	10.00
Dept. 4 variable operating cost (45/60 x Rs. 70)	52.50
Dept. 5 Variable operating cost (20/60 x Rs. 72)	24.00
Total Relevant Cost	86.50

Additional contribution for various selling prices / demand levels

Particulars	**Rs.**	**Rs.**	**Rs.**
Selling price per unit	100	110	120
Restricted demand (Units)	*1066	1000	500
Relevant cost	86.50	86.50	86.50
Contribution p.u.	13.50	23.50	33.50
Total additional contribution	14,391	23,500	16,750

*** Note :** The available spare time is 16 hrs. per week x 50 weeks = 800 hours

Hence, maximum output possible in Dept. 4 = (800 Hrs x 60/45) = 1,066 Units

Conclusion : Considering highest additional contribution Rs. 23,500, it is advisable to sell 1000 units @ Rs. 110 per unit to achieve optimum gain. The additional weekly gain shall be Rs. 470 per week (i.e. Rs. 23,500 / 50 weeks).

PROBLEM NO. 2 :

A company has prepared the following budget for the forthcoming year:

Particulars	Rs. lakhs
Sales	20.00
Direct materials	3.60
Direct labour	6.40
Factory Overheads:	
Variable	2.20
Fixed	2.60
Administration overheads	1.80
Sales commission	1.00
Fixed selling overheads	0.40
Total costs	18.00
Profit	2.00

The policy of the company in fixing selling prices is to charge all overheads other than the prime costs on the basis of percentage of direct wages and to add a markup of one- ninth of total costs for profit.

While the company is confident of achieving the budget drawn up as above, a new customer approached the company directly for execution of a special order. The direct materials and direct labour costs of the special order are estimated respectively at Rs. 36,000 and Rs. 64,000. This special order is in excess of the budgeted sales as envisaged above. The company submitted a quotation of Rs. 2,00,000 for the special order based on its policy. The new customer is willing to pay a price of Rs.1,50,000 for the special order. The company is hesitant to accept the order below total cost as, according to the company management, it will lead to a loss.

You are required to state your arguments and advise the management on the acceptance of the special order.

ANSWER 2 :

The following points should be considered for acceptance of new order:

(i) Variable factory overheads only are to be recovered on the basis of direct wages.

(ii) The special order is a direct order. Hence sales commission is not payable.

(iii) The budgeted sales are achieved. Hence all fixed overheads are recovered. Hence, no fixed overheads will be chargeable to the special order.

(iv) Administration overheads are assumed to be fixed, hence ignored in new order.

Based on the above, the factory variable overheads recovery rate may be calculated as under:

Total variable factory overheads Rs. 2.20 lakhs

Direct wages Rs. 6.40 lakhs

Factory overhead rate = (2.20 / 6.40) x 100 = 34.375%

Applying this rate the cost of the special order will be as under:

Particulars	Rs.
Direct materials (given)	36,000
Direct labour (given)	64,000
Variable overheads 34.375% of direct wages	22,000
Total costs	1,22,000
Price offered	1,50,000
Margin	28,000

Conclusion: Considering profit, the order is acceptable at the price of Rs. 1,50,000.

PROBLEM NO. 3 :

Hind Metals Manufactures an alloy product 'Incop' by using Iron and Copper. The metals pass through two plants, X and Y. The company gives you the following details for the manufacture of one unit of Incop:

Materials	Iron: 10 kgs @ Rs.5 per kg. Copper: 5 kg @ Rs.8 per kg.
Wages	3 hours @ Rs.15 per hour in Plant X 5 hours @ Rs.12 per hour in Plant Y
Overhead recovery	On the basis of direct labour hours
Fixed overhead	Rs. 8 per hour in Plant X Rs. 5 per hour in Plant Y
Variable overhead	Rs. 8 per hour in Plant X Rs. 5 per hour in Plant Y
Selling overhead	(fully variable) – Rs.20 per unit

(i) Find out the minimum price to be fixed for the alloy, when the alloy is new to the market. Briefly explain this pricing strategy.

(ii) After the alloy is well established in the market. What should be the minimum selling price? Why?

ANSWER 3 :

Statement showing calculation of Variable & Total Cost per unit of alloy:

Materials:		
Iron 10 kg @ Rs. 5/-	50	
Copper 5 kg @ Rs.8/-	40	90
Wages		
X : 3 hrs @ 15 Rs./Hr.	45	
Y: 5 hrs @ 12 Rs./Hr	60	105
Variable OH (Production)		
X : Rs. 8/hr x 3 hrs	24	
Y : Rs. 5/hr x 5 hrs	25	49
Variable OH – Selling		20
Total Variable Cost		264
Fixed Overheads		
X : Rs. 8/hr x 3 hrs.	24	
Y : Rs. 5/hr x 5 hrs	25	49
Total Cost		313

(i) When the alloy is new to the market, then penetration pricing strategy should be adopted to gain foothold in the market. In such case, the minimum price for a new product should be the variable cost i.e. Rs. 264/-. In some circumstances, it can also be sold below the variable cost, if it is expected to quickly penetrate the market and later absorb a price increase. Variable Cost per unit is the penetration price.

(ii) When the alloy is well established, the minimum selling price will be the total cost i.e. including the fixed cost i.e. Rs. 313 per unit. Actual selling price shall be above the total cost per unit. In long run, we must recover total cost including fixed cost also.

PROBLEM NO. 4 :

The Board of Directors of XY Company Limited are considering a new type of handy sewing machine which their R & D Department has developed. The expenditure so far on research has been ₹ 95,000 and a consultant's report has been prepared at a cost of ₹ 22,500. The report provides the following information :

Cost of production per unit	₹
Material	45.00
Labour	75.00
Fixed overheads	20.00
(Based on Company's normal allocation rates)	
Total	140.00

Anticipated additional fixed costs :

Rent for additional space ₹ 1,25,000 per annum

Other additional fixed costs ₹ 70,000 per annum

A new machine will be built with the available facilities with a cost of ₹1,10,000 (material ₹90,000 and labour ₹20,000). The materials are readily available in stores which are regularly used. However, these are to be replenished immediately. The price of these materials have since been increased by 50%. Scrap value of the machine at the end of the 10th year is estimated at ₹20,000. The product scraps generated can be disposed off at the end of year 10 for a price of ₹1,43,000.

Years 1 – 5		Years 6 – 10	
Demand (units)	**Probability**	**Demand (units)**	**Probability**
40,000	0.15	24,000	0.30
20,000	0.60	16,000	0.50
12,000	0.25	4,000	0.20

It is estimated that the commercial life of the machine will be no longer than 10 years and the after tax cost of capital is 10%. The full cost of the machine will be depreciated on straight line basis, which is allowed for computing the taxable income, over a period of 10 years. Tax rate is 30%.

DCF Factors at 10%: 1 – 5 years (cumulative) 3.79

6 – 10 years (cumulative) 2.355

10^{th} year 0.386

Required: Compute minimum selling price for the handy sewing machine.

ANSWER 4 :

Key Data:-

- Expenditure on research ₹95,000 and Cost of Consultant's report ₹ 22,500 being sunk cost are irrelevant for decision making, hence ignored.
- Variable Cost per Unit = Material + Labour = 45 + 75 = ₹ 120 p.u.
- Absorbed fixed overheads are irrelevant.
- Additional fixed cost is relevant i.e. 1,25,000 + 70,000 = ₹ 1,95,000 p.a.
- Cost of building new machine, on relevant cost basis shall be –

  = Material (90,000 + 50%) + Labour 20,000

  = 1,35,000 + 20,000 = ₹ 1,55,000
- Annual depreciation on full cost basis shall be –

  = ₹ 1,55,000 ÷ 10 years = ₹ 15,500 p.a.
- Expected demand in the market shall be –

  Years 1 to 5 = (40,000 x 0.15) + (20,000 x 0.60) + (12,000 x 0.25) = 21,000 Units p.a.

  Years 6 to 10 = (24,000 x 0.30) + (16,000 x 0.50) + (4,000 x 0.20) = 16,000 Units p.a.

(1) Calculation of Cashflow after tax : (Assuming Sales Price Per Unit = a)

Particulars	Year 1 to 5	Year 6 to 10
(a) Annual Sales	21,000 a	16,000 a
(b) Variable Cost	25,20,000 (21,000 x 120)	19,20,000 (16,000 x 120)
(c) Additional Fixed Cost	1,95,000	1,95,000
(d) Annual depreciation	15,500	15,500
(e) Profit before tax (a – b – c – d)	[21,000 a – 27,30,500]	[16,000 a – 21,30,500]
(f) Tax @ 30% of (e)	[6,300 a – 8,19,150]	[4,800 a – 6,39,150]
(g) Profit after tax [e – f]	[14,700 a – 19,11,350]	[11,200 a – 14,91,350]
(h) Cashflow after tax [g + d]	[14,700 a – 18,95,850]	[11,200 a – 14,75,850]

(2) Calculation of Minimum Sales Price

Expected rate of return after tax = 10% i.e. IRR

At IRR, P.V. of Cash inflows = P.V. of Cash outflow (i.e. Investment)

∴ [P.V. of annual cashflows + P.V. of scrap of machine, net of tax + P.V. of product scrap sold, net of tax] = Relevant Cost of building new machine

∴ [(14,700 a – 18,95,850) x 3.79] + [(11,200 a – 14,75,850) x 2.355] + [20,000 x 70% x 0.386] + [1,43,000 x 70% x 0.386] = 1,55,000

∴ 55,713 a – 71,85,271 + 26,376 a – 34,75,627 + 5,404 + 38,639 = 1,55,000

∴ 82,089 a = 1,07,71,855

∴ a = ₹ 131.22 (approx)

∴ Minimum Sales Price = ₹ 131.22

Notes / Assumption:-

1) As depreciation was charged on full cost basis, the scrap value of machine is taxable.
2) Sale of product scrap at the end of 10th year is also taxable.
3) In order to Calculate Minimum Selling Price of Sewing machine, irrelevant costs are ignored.

PROBLEM NO. 5 :

An IT Company produces a CD, particulars of which are detailed below:

Annual Production (units)	40,000
Cost per annum (₹)	
(i) Material	1,00,000
(ii) Other Variable Cost	1,20,000
(iii) Fixed Cost	80,000
Apportioned Investment (₹)	3,00,000

Determine the Unit Selling Price under 2 strategies mentioned below.

Assume Company's Tax Rate as 30%.

(a) 20% Return on Investment.

(b) 6% Profit on List Price, when trade discount is 40%.

ANSWER 5 :

(i) Selling price to Yield 20% Return on Investment :

Investments (₹)	3,00,000
Required ROI (after tax) @ 20% [20% of ₹ 3,00,0000] (₹)	60,000
Tax rate	30%
After tax profit	70%
Pre Tax profit [₹ 60,000 ÷ 70 x 100] (₹)	85,714
Sales (Total cost + required profit) [₹ 1,00,000 + ₹ 1,20,000 + ₹ 80,000 + ₹ 85,714]	3,85,714
Number of units produced	40,000
Selling price per unit (₹ 3,85,714 ÷ 40,000 units) (₹)	9.64

(ii) Selling price to yield 6% profit on list price, when Trade Discount is 40% :

Let's assume total sales at list price = X

[List sales x (1 – Trade discount) - Total cost] x (1 - Tax rate) = 0.06X

[X (1 - 0.40) – 3,00,000] x (1 – 0.30) = 0.06X

[0.60 X – 3,00,000] x 0.70 = 0.06X

0.42 X – 2,10,000 = 0.06X

0.36X = 2,10,000

X = ₹ 5,83,333

List sales price per unit (₹ 5,83,333 / 40,000 units) = ₹ 14.58

Net selling price after trade discount per unit = (₹ 14.58 – 40%) = ₹ 8.75

PROBLEM NO. 6 :

A Company produces a single product 'Impex'.

For an annual sales of 40,000 units of Impex, fixed overhead is ₹ 5,50,000. The Variable Cost per unit is ₹ 60. Capital Employed in Fixed Assets is ₹ 8,00,000 and in Current Assets is 50% of Net Sales (i.e. Sales less Discount).

The Company sells goods at 20% discount on the Maximum Retail Price (M.R.P), which is ₹ X per unit. The Company wants to earn a Return of 25% before tax on Capital Employed in Fixed and Current Assets.

Determine the value of X.

ANSWER 6 :

Sales – Total Cost = 25% return on Capital Employed

$\therefore$ (40,000X – 20%) – (5,50,000 + 24,00,000) = 25% x [8,00,000 + 50% x (40,000X x 0.8)]

$\therefore$ 32,000X – 29,50,000 = 25% x (8,00,000 + 16,000X)

$\therefore$ 32,000X – 29,50,000 = 2,00,000 + 4,000X

$\therefore$ 28,000X = 31,50,000 $\therefore$ X = 112.50 MRP

PROBLEM NO. 7 :

State the most appropriate Pricing Policy to be adopted in the following independent situations.

(i) Modern Patented Drug entering the market.

(ii) The latest version of a Mobile Phone is being launched by an established, financially strong company.

(iii) An established company has recently entered the stationery market segment and launched good quality paper for printing at home and office.

(iv) A car manufacturer is launching an innovative, technologically advanced car in the highly priced segment.

ANSWER 7 :

Sr. No.	My View	ICAI View
(i)	Skimming Pricing	Same
(ii)	Penetration Pricing	Same
(iii)	Penetration Pricing	Market Price
(iv)	Skimming Pricing	Same

PROBLEM NO. 8 :

A company manufactures a product Y in addition to other products by using the same machines in department A and department B. The usage details per unit of Product Y are :

Particulars	Department A		Department B	
	Usage	Rate	Usage	Rate
Direct Material	8 kg	₹ 4	4 kg	₹ 6
Direct Labour	2 hours	₹ 14	3 hours	₹ 12

Basis of overhead recovery are given below :

Particulars	Department A per rupee of direct material	Department B per direct labour hour
Variable Overheads	₹ 0.80	₹ 2
Fixed Overheads	₹ 2.20	₹ 3

Other details are :

Value of Plant & Machinery in Dept. A is ₹ 22 lacs and in Dept. B is ₹ 18 lacs. Out of which 40% of machine capacity will be used by Product Y. The working capital requirement of Product Y, based on a target volume of output of 2,000 units per month is estimated at ₹ 2,72,800 per annum.

Required :

(i) Calculate the selling price of Product Y to ensure contribution equivalent to 25% of investment made.

(ii) If Product Y is a new product about to be launched in the market, on what basis should the price be fixed and what would be the minimum price ?

(iii) If Product Y is a well established product, what should be the basis for price fixing and what would be the minimum price ?

ANSWER 8 :

1. Calculation of the selling price to ensure contribution of 25% of investment :

Particulars	₹	₹
(a) Direct Material Cost :		
Department A [8 kg x ₹ 4]	32.00	
Department B [4 kg x ₹ 6]	24.00	56.00
(b) Direct Labour Cost :		
Department A [2 hours x ₹ 14]	28.00	
Department B [3 hours x ₹ 12]	36.00	64.00
(c) Variable Overheads :		
Department A [₹ 32 x 0.80]	25.60	
Department B [3 hours x ₹ 2]	6.00	31.60

(d) Total Variable Cost per unit [a + b + c]		151.60
(e) Total value of investment for Y :		
Plant & Machinery in Dept. A [40% of 22 lakhs]	8,80,000	
Plant & Machinery in Dept. B [40% of 18 lakhs]	7,20,000	
Working Capital for Product Y [given]	2,72,800	18,72,800
(f) Desired total contribution [(e) x 25%]		4,68,200
(g) Contribution per unit [4,68,200 / 24,000 units p.a.]		19.51
(h) Selling Price per unit [d + g] i.e. [VC + Contbn.]		**171.11**

2. If Product Y is a new product about to be launched in the market, and if it is a competitive market, then we should fix the selling price based on 'Penetration Pricing' policy. In such case the minimum price could be variable cost per unit i.e. ₹ 151.60

3. If Product Y is a well established product, then we can fix the selling price based on total cost plus profit approach. In such case the minimum price could be Total Cost i.e. variable cost per unit + fixed cost per unit [i.e. ₹ 151.60 + (32 x 2.20) + (3 hrs. x 3)] = ₹ 231 per unit.

Question 9 : [May 2019 Exam - 20 Marks]

Amber Ltd is a leading company in the Footwear Industry. The company has four factories in different locations with state of the art equipments. Due to competition in the market, company is continually reviewing its product range and enhancing its existing products by developing new models to satisfy the demands of its customers.

The company currently has a production facility which has a capacity of 3,500 standard hours per week.

Product 'Comfort' was introduced to the market six months ago and is now about to enter the maturity stage of its life cycle.

However, research by the marketing department indicates that demand of the product 'Comfort' in the market is price sensitive. The likely market responses are as follows :

Selling price per unit (₹)	1,750	1,600	1,525	1,450	1,300
Sales demand per week (units)	550	725	1,000	1,150	1,200

The variable cost per unit of manufacturing 'Comfort' is ₹ 750.

Standard hours used to manufacture one unit is 2 hours.

Product 'Sports' was introduced to the market two months ago using a penetration pricing policy and is now about to enter its growth stage. Each unit a variable cost of ₹ 545 and takes 2.50 standard hours to produce. Market research has indicated that there is a linear relationship between its selling price and the number of units demanded, of the form P = a – bx. At a selling price of ₹ 1,000 per unit, demand is expected to be 1,000 units per week. For every ₹ 100 increase in selling price, the weekly demand will reduce by 200 units and for every ₹ 100 decrease in selling price the weekly demand will increase by 200 units.

Product 'Ethnic' is currently being developed and which is about to be launched in the market. This is a highly innovative designer product which the company believes that it will have a revolutionary impact on the market and consumer behaviour. The company has decided to use a market skimming approach to pricing this product during its introduction stage.

Required :

(a) (i) ADVISE which of the above five selling prices should be charged for product 'Comfort', in order to maximize its contribution during its maturity stage. **(3 marks)**

(ii) CALCULATE the number of units to be produced of product 'Sports' in order to utilize all of the spare capacity from your answer to (i) above and the selling price per unit of product 'Sport' during its growth stage. **(2 + 3 = 5 marks)**

(b) COMPARE penetration and skimming pricing strategies during the introduction stage, using product 'Ethnic' to illustrate your answer. **(4 marks)**

(c) EXPLAIN with reasons, for each of the stages of 'Ethnic' product life cycle, the changes that would be expected in the -
(i) Average unit production cost
(ii) Unit selling price **(4 + 4 = 8 marks)**

Answer 9 :

(a)(i) Selling Price for "Comfort" that would maximize its contribution at Maturity Stage:

Contribution per unit of "Comfort" = Selling Price per unit – Variable Cost per unit

Total Contribution = Contribution per unit x No. of units sold

All figures in Rupees

Sales (units) per week	550	725	1,000	1,150	1,200
Selling Price per unit	1,750	1,600	1,525	1,450	1,300
Variable cost per unit	750	750	750	750	750
Contribution per unit	1,000	850	775	700	550
Total Contribution	5,50,000	6,16,250	7,75,000	8,05,000	6,60,000

Advise : Total contribution is maximum when sales are 1,150 units. Therefore, the selling price per unit of "Comfort" should be **Rs. 1,450 per unit.**

(a)(ii) Production Units of "Sports" and Selling Prices per unit :

Amber Ltd. has a production capacity of 3,500 hours per week. As explained in (i) above, it would manufacture 1,150 units of "Comfort" per week. Each unit of "Comfort" requires 2 hours of production. Therefore, total production hours for Comfort would be 1,150 units x 2 hours = 2,300 hours per week.

Production capacity remaining to manufacture "Sports" = 3,500 hours – 2,300 hours = **1,200 hours per week.** Each unit of "Sports" requires 2.5 hours of production.

Therefore, the number of "Sports" units that can be produced = 1,200 hours / 2.5 hours = **480 units per week.**

Linear relationship between Selling Price and Number of Units Demanded has been given to be $P = a - bx$ Where -

P = Selling Price per unit.

a = Selling Price when demand will be zero.

b(slope) = Change in Price / Change in Quantity.

x = Quantity Demanded.

Given, at a Selling Price of Rs. 1,000 per unit, Quantity Demanded will be 1,000 units per week. For every Rs. 100, per unit increase/decrease in Selling Price, the Quantity Demanded will decrease/increase by 200 units per week respectively. A Rs. 500 per unit increase in Selling Price will result in fall of 1,000 units of Sales per week. The Selling Price at which Sales will become Zero shall be : a = 1,000 + 500 = ₹ 1,500 per unit.

b (slope) = Change in Price/Change in Quantity = Rs.100/200 = 0.50

Penetration pricing is most commonly associated with a marketing objective of increasing market share or sales volume, rather than short term profit maximization. Thus, substituting the values in the equation to find the Selling Price of "Sports" when the Quantity Sold is 480 units.

$$P = a - bx$$
$$= 1,500 - 0.50 \times (480)$$
$$= 1,500 - 240$$
$$= ₹ 1,260$$

Hence, Sports should be sold at ₹ 1,260 per unit during the growth stage.

Alternatively :

Hours after production of Product "Comfort" (3,500 – 1,150 x 2) = 1,200 hours to be utilized to produce product 'Sports".

1,200 hours / 2.5 = 480 units can be produced.

10% increase in selling price will lead to 20% decrease in demand of units of product "Sports". Here, we can produce only 480 units which amounts to 52% decrease in units so the selling price should be increased by 26% as per given price demand function. So, the selling price per unit will be 1,000 + 26% = ₹ 1,260 for 480 units of product "Sports".

Ans. (b) : "Ethnic" is given to be a highly innovative product that is about to be launched in to the market. The product with unique features that will differentiate it from other products leading to a revolutionary impact on market and customer behaviour. There seems to be no competitors providing similar products.

Skimming Price Strategy is adopted to charge high prices in the introduction stage in order to recover costs. Skimming Price will be suitable for 'Ethnic' because :

- Market for the product is not yet established. Initially high promotional expenses may have to be incurred to create customer awareness and build a market for the product.
- Due to its innovative feature, the customers would not mind paying a premium for the unique product offering. Demand would be inelastic.
- The market demand is unknown. Initial capital outlay to produce this product may be high, resulting in high cost of production.
- Production and promotional costs in the initial years is likely to be high. Therefore, a higher selling price would help Amber Ltd. to recover the costs faster. Since demand is likely to be inelastic, charging a premium may not be a problem.
- The price can be gradually reduced once the market for the product is established. Competitors may reverse engineer and offer similar products, due to which price may have to be lowered in the long run to retain customers.

Penetration Pricing is adopted to charge a low price in the initial stage for penetrating the market as quickly as possible. For a new product, this low-price strategy will popularize the product. Once the market is established, the price may be increased. Penetration pricing will be suitable when :

- Demand for the product is elastic, i.e. higher demand at lower prices.
- Large scale production of the product yields economies of scale.
- Threat of competition requires prices to be set low. It serves as an entry barrier to prospective competitors as well.

Conclusion : Product 'Ethnic' is an innovative product that the manufacturer believes will change the whole market once it is launched. A strategy of penetration pricing could be effective in discouraging potential new entrants to the market. However, the product is believed to be unique and as such demand is likely to be fairly inelastic. In this instance a policy of penetration pricing could significantly reduce revenue without a corresponding increase in sales. Thus, this strategy is not suitable for 'Ethnic'.

Ans. (c) Impact on Unit Selling Price and Average Cost of Production per unit at each stage of "Ethnic" Product Lifecycle :

Introduction Stage :

As explained in (b) above, at the Introduction Stage of Lifecycle, due to high cost of production and initial promotion expenditure, the unit cost of production will be high. Using Skimming Pricing Policy, the unit selling price will also be high.

Growth Stage :

This is the second phase of Product Life-Cycle. Product awareness with customers would result in increased demand. Therefore, scale of production is likely to increase. The new market segment would attract competitors, who are likely to do reverse engineering and offer similar products in the market. Promotional activities and marketing activities need to continue to maintain and gain market share.

Accordingly, the unit selling price would reduce from the introduction stage on account of the following reasons:

- Competitors offering similar product would take away the uniqueness feature of "Ethnic".
- Again, to gain market share, the unit selling price may have to be lowered to make it attractive to a larger segment of customers.

The unit cost of production is also likely to reduce due to the following reasons:

- Increased production would result in increased material procurement from suppliers. Bulk purchasing discounts can be negotiated with them to lower cost of production.
- Learning curve and experience would enable the labour force to become more efficient. This leads to higher production with the same level of resources leading to cost savings.
- Larger production batches due to increase in scale of operations will reduce the unit variable overhead cost.
- Economies of scale would result due to fixed overhead cost being spread over larger number of units.

Maturity Stage :

The third phase of Product Life-Cycle that is characterized by an established market for "Ethnic". After rapid growth in sale volume in the previous stages, growth of sales for the product will saturate. Competition would be high due to larger number if rivals in the market, this may lead to decrease in market share.

It is likely that the price of the product will be lowered further at the maturity stage in a bid to preserve sales volumes. The company may attempt to preserve sales volumes by employing an extension strategy rather than reducing the selling price. For example, they may introduce product add-ons to the market that are compatible with "Ethnic".

Unit production cost will remain constant due to the following :

- Direct material cost will remain constant. If procurement is lower than the growth phase, it might even lead to slightly higher prices since supplier may not extend bulk discounts.
- The benefits of efficient production due to the effect of learning and experience may also have waned. Therefore, unit labour cost is also likely to remain constant.
- Since scale of production is no longer increasing, the unit variable overhead costs are also likely to remain constant.

Decline Stage

This last stage in the product cycle is characterized by saturated market, declining sales, change in customer's tastes etc. Profitability may slowly start decreasing with fall in sales.

At the decline stage, Product "Ethnic" is likely to have been surpassed by more advanced products in the market and consequently will become obsolete. The company will not want to incur inventory holding costs for an obsolete product and is likely to sell "Ethnic" at marginal cost or perhaps lower.

Sales volumes at the decline stage are likely to be low as the product is surpassed by new exciting products that have been introduced to the market. Furthermore, the workforce may be less interested in manufacturing a declining product and may be looking to learn new skills. For both of these reasons, unit production costs are likely to increase at the decline stage.

Question 10 :

Zutus Ltd. is a leading Indian Pharmaceutical company which is a fully integrated, global healthcare provider. With in-depth domain expertise in the field of healthcare, it has strong capabilities across the spectrum of the pharmaceutical value chain. Zutus has earned reputation worldwide amongst pharmaceutical companies for providing comprehensive and complete healthcare solutions.

One of the drugs, Rifmn is an antibiotic used to treat contagious disease "Tbis". Rifmn is a patented medicine. The patent for which is now going to expire, and several other competitors are expected to enter in the market for selling the medicine using the same components of chemicals, under different other names. In order to reposition itself in the market, the company is reviewing its pricing policy considering the market change and other threat.

The market research for Rifmn indicates that for every ₹ 4 decrease in price, demand would be expected to increase by 8,000 batches, with maximum demand for Rifmn being one million batches.

Each batch of Rifmn is currently made of using chemical salts :

Salt X : 367.50 gm at ₹ 0.08 per gm.

Salt Y : 301.50 gm at ₹ 0.40 per gm.

Each batch of Rifmn requires 30 minutes of machine time to make and the variable running costs for machine time are ₹ 40 per hour. The fixed production overhead cost is expected to be ₹ 35 per batch for the period, based on a budgeted production level of 3,00,000 batches.

The skilled workforce who has been working on Rifmn until now are being shifted onto the production of Zutus company's new antiviral drug (injection) for Viral Disease-19 which costs millions of ₹ to develop. Zutus has obtained patent for this revolutionary drug and it is expected to save millions of lives all across the world. The launch of this drug is excitedly anticipated all over the world, while its demand is unknown and no other similar specific drug exists. The average labour cost (outsourcing) of each batch of Rifmn is ₹ 38.60.

The management of Zutus considers that pricing decision of Rifmn should be based on each batch.

Required :

(i) CALCULATE the optimum (profit-maximizing) selling price for Rifmn and the resulting annual profit which Zutus will make from charging this price.

(ii) RECOMMEND the pricing strategy for launching of new antiviral drug.

[Note : If P = a – bQ, then MR = a – 2bQ]

Answer 10 :

(i) Calculation of Optimum Selling Price of Rifmn :

Marginal cost per batch (i.e. Variable cost) :

Particulars	Calculations	₹
Salt X	367.50 gm x ₹ 0.08	29.40
Salt Y	301.50 gm x ₹ 0.40	120.60
Labour (outsourcing)	Given in question	38.60
Machine running cost	(30/60 x ₹ 40.00)	20.00
Total marginal cost per batch		208.60

b = change in price/change in quality

b = ₹ 4 / 8,000 units = 0.0005

The maximum demand for Rifmn is 10,00,000 units. It is interpreted by ICAI as, when P = 0, then Q = 10,00,000. Value of 'a' can be calculated by substituting these values for P and Q into the price function as follows :

P = a – bQ

0 = a – (0.0005 x 10,00,000)

0 = a – 500 Hence, a = 500

Price function is therefore : P = 500 – 0.0005Q

Marginal revenue function : MR = a – 2bQ

Let's Calculate Optimum Quantity First

At Optimum Quantity, MC and MR are equal. Let's equate MC = MR

208.60 = 500 – (2 x 0.0005 x Q)

208.60 = 500 – 0.001Q

0.001Q = 291.4

Q = 2,91,400 batches

Calculation of optimum selling price

P = 500 – (0.0005 x 2,91,400)

P = ₹ 354.30 per batch

Calculation of Maximum Profit :

Particulars	₹
Revenue (2,91,400 batches x ₹ 354.30)	10,32,43,020
Less: Variable costs (2,91,400 batches x ₹ 208.60)	6,07,86,040
Less: Fixed costs (3,00,000 batches x ₹ 35)	1,05,00,000
∴ Profit	3,19,56,980

(ii) **Pricing Strategy for New Drug :** Firms often use different pricing strategies when their products are first launched in to the market. The most common two approaches are : skimming pricing and penetration pricing.

In **penetration pricing**, low price is charged initially. Thought behind this is that low price will make the product accessible to large number of buyers, so high sales will compensate the low price being charged getting the benefits of economies of scale. This approach works best when customers are price sensitive, R & D and marketing expenses are low, or when competitors will quickly enter the market.

In the given case, medicine prices are highly inelastic in nature, so any reduction in price will not increase the demand of the drug, which clearly indicates that market penetration pricing will not help.

Skimming Pricing refers to charging high price initially and then lower the prices. High price in the early stage of the product's life cycle is expected to generate high initial cash flows, which will help the company to recover high research & development cost. This would enable the company to take advantage of unique nature of the product. It is mentioned in the question that the product is revolutionary in nature and hence skimming pricing is justified.

In the present case, the unique nature of drug, high entry barrier (since company has taken patent) and huge initial investment suggests that skimming pricing strategy would be more favourable pricing strategy. However, the strategy only works as long as drug is protected by patent.

In addition, a drug firm is required to consider the expected reactions from national price controller who in turn may be influenced by political factors and public opinion. If the price is regulated by Government, then we will have little control over it.

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