Group - IV
Paper 17 - Strategic Performance Management

Section –A

1. (a) Describe the objectives of Competitive intelligence.

(b) A co. has two divisions viz., processing and refining. Processing division produces 500 tonnes of product M from 1,000 tonnes of a raw material per month. Refining division produces 300 tonnes of product FM from 500 tonnes of M received from the processing division. The cost data are:

Processing Division:

Raw Materials	**₹ 120 per tonne of input.**
Variable Costs	**₹ 80 per tonne of Output.**
Fixed Assets	**₹ 50,000 per month.**

Refining Division:

Variable costs	**₹ 30 per tonne of output.**
Fixed cost	**₹ 21,000 per month.**

The market price of product M is ₹ 500 per tonne and of product FM is ₹1,200 per tonne.

Required:

(i) Compute the overall profit of the company for the month;

(ii) Compute the profit each division based on the following pricing methods:

(a) 200% of variable costs of processing Division for M

(b) Market price for M;

(iii) Which method will you recommend and why?

(c) Does the Benchmarking tantamount to Industrial Espionage.

Answer of 1:

(a) Organizations constantly seek new ways to achieve sustainable competitive advantage and to counter aggressive competition. Proactive organizations recognize the advantage to be gained from an organized competitive intelligence program. In the Japanese semiconductor industry, for example, large organizations such as Mitsubishi, Mitsui, Sumitomo and Marubeni maintain intelligence departments that rival the U.S. Central Intelligence Agency in ability and accuracy. In the U.S., competitive intelligence programs are a popular tool among companies such as IBM Corp., Texas Instruments, Inc., Citi Corp, AT&T Inc., U.S. Sprint, McDonnell Douglas Corp., and 3M.

Organizations develop competitive intelligence programs with the following objectives in mind:

(i) To provide an early warning of opportunities and threats, such as new acquisitions or alliances and future competitive products and services;

(ii) To ensure greater management awareness of changes among competitors, making the Organization better able to adapt and respond appropriately;

(iii) To ensure that the strategic planning decisions are based on relevant and timely competitive Intelligence; and

(iv) To provide a systematic audit of the organization's competitiveness that gives the CEO an unfiltered and unbiased assessment of the firm's relative position.

(b)

Processing Division

Product M	Total Cost (₹)	Output of M 500 tonnes Cost per tonne
Raw materials (1,000 x 120)	1,20,000	240
Processing variable cost (500 x 80)	40,000	80
Total variable cost	1,60,000	320
Fixed costs	50,000	100
Total cost of processing	2,10,000	420

(i)

Statement showing overall profit of the company

Sales (FM-300 x ₹ 1,200):			₹ 3,60,000
Processing Division cost transferred		₹ 2,10,000	
Refining Division Cost:			
Variable costs (300 x₹ 30)	9,000		
Fixed cost	21,000	30,000	
Profit			2,40,000
			1,20,000

(ii)

Statement showing profit from each Division

Particulars	200% of variable cost of processing (₹)	Market price (₹)
Processing Division: Selling price (₹ 320 x 2)	640	500
Sale (500 tonnes)	3,20,000	2,50,000
Costs	2,10,000	2,10,000
Profit	1,10,000	40,000
Refining Division : Selling price	1,200	1,200
Sales (300 tonnes)	3,60,000	3,60,000
Transfer price	3,20,000	2,50,000
Cost of refining	30,000	30,000
Profit	**10,000**	**80,000**

(iii) The transfer price based on 200% of variable cost is ₹ 640 per tonne while the market price is ₹ 500 per tonne. If the Divisions are organized into profit centers, the Refining Division is tempted to buy from the outside market.

If the Processing Division has no alternative use for its spare capacity/fully capacity, its fixed costs of ₹ 50,000 will remain unrecovered. Thus, charging a price for the captive products higher than the Market price will be dysfunctional.
When market price method is used Processing Division will be encouraged to reduce its costs to improve contribution. The Refining Division will also be encouraged to make product competitive.
Assuming that there is idle capacity in each Division, with the transfer price matching with the market price, both the Divisions will be eager to reap the

benefit of larger scale production. Individual Division's profit will increase and so will be the overall profit of the company.

(c) The initiation of benchmarking study pre-supposes voluntary and willing co-operation between the benchmarking parties to open up their books on a reciprocal basis. It is implicitly understood that no information of proprietary or confidential nature will be parted and the sharing of information and experience is in total conformity with ethical conduct. In short, the benchmarking exercise should result in a win - win situation.

The APQC - IBC has drawn up a benchmarking code of conduct which sets forth the protocol of benchmarking - a set of conventions prescribing correct etiquette and procedures to be used in conducting benchmarking studies

2 (a) Define Customer Relationship Management.

(b) Discuss the role of Cost Accountant in Benchmarking.

(c) The following information relates to budgeted operation of Division X of a Manufacturing company

Particulars	₹
Sales (50,000 units of ₹ 8)	4,00,000
Less: Variable costs @ ₹ 6 per unit	3,00,000
Contribution margin	1,00,000
Less: Fixed costs	75,000
Divisional Profit	25,000

The amount of divisional investment is ₹ 1,50,000 and the minimum desired rate of return on the investment is the cost of capital of 20%.

Required:

(i) Calculate divisional expected ROI

(ii) Calculate divisional expected RI

(iii) Comment on the results of (i) and (ii)

(iv) The divisional manager has the opportunity to sell 10,000 units at ₹ 7.50 per unit. Variable cost per unit would be the same as budgeted, but fixed costs would increase by ₹ 5,000. Additional investment of ₹ 20,000 would also be required. If the manager accepts the special order, by how much and in what direction would his residual Income change?

Answer of 2:

(a) There are as many definitions for CRM as there are opinions as to what is going to happen in the stock market the next day. At its basic core, CRM entails initiatives that surround the customer side of the business. An example is initiatives wrapped around the customers in an effort to increase sales, improve customer service, add market share, enhance customer loyalty and reduce operating costs of sales and service. At its more formal definition, CRM is a business strategy comprised of process, organizational and technical change whereby a company seeks to better manage its enterprise around its customer behaviors. It entails acquiring and deploying knowledge about customers and using this information across the various customers touch points to increase revenue and achieve cost reduction through operational efficiencies.

The adoption of CRM is being fuelled by recognition that long-term relationships with customers are one of the most important assets of an organization.

It entails all aspects of interaction that a company has with its customer, whether it is sales or service related.

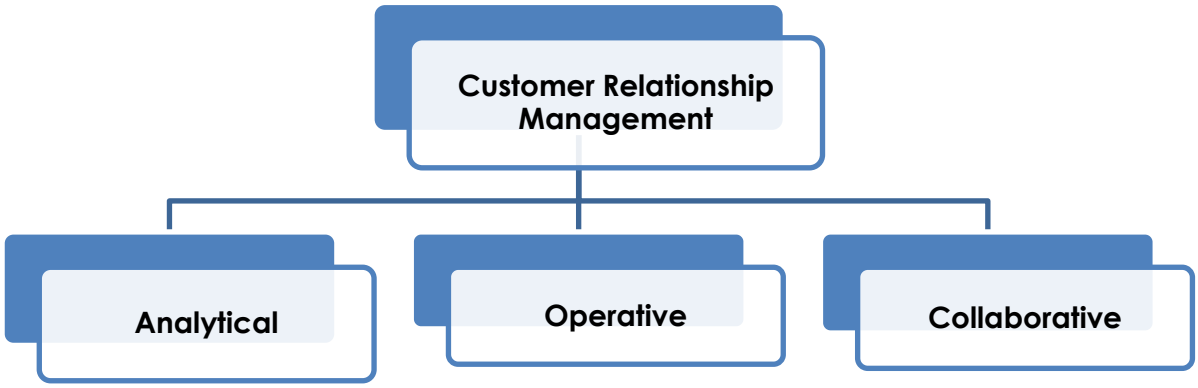
CRM is often thought of as a business strategy that enables businesses to:

- Understand the customer
- Retain customers through better customer experience

- Attract new customer
- Win new clients and contracts
- Increase profitably
- Decrease customer management costs

CRM is an integrated approach to identifying, acquiring and retaining customers. By enabling organizations to manage and coordinate customer interactions across multiple channels, departments, lines of business and geographies, CRM helps organizations maximize the value of every customer interaction and drive superior corporate performance.

Parts of CRM



(b) A Cost Accountant is positioned at the core of Benchmarking process as follows:

(i) A key part of benchmarking understands how a company's internal systems operate. This is a primary ongoing function of a Cost Accountant.

(ii) A benchmarking team requires a lot of information relating to current cost and Cost Accountant renders very valuable assistance in this regard. Internal costing information is most easily accessed by the Cost Accountant.

(iii) A Cost Accountant can render useful assistance in obtaining benchmarking information from target companies. Though any one can with proper training and a well prepared questionnaire can obtain this information, it is better to use Cost Accountant for this purpose, because a Cost Accountant can examine weak answer and discover key information, whose absence may not be apparent to anyone else.

(iv) A Cost Accountant can be used to compare the internal and external information. In short, a Cost Accountant acts as chief financial analyst on a benchmarking team. Both assembling and reviewing the key information used by the team to arrive at a list of suggested recommendations for improvement.

(c)

(i) $ROI = \frac{₹25,000}{₹1,50,000} \times 100\% = 16.7\%$

(ii) RI = Divisional Profit – Minimum desired rate of return
= ₹ 25,000 – (20% x ₹ 1,50,000)
RI = (₹ 5,000)

(iii) The desired rate of return is 20% but the division X is expecting to achieve an ROI of 16.7%. The expected profit of ₹ 25,000 is less than the ₹ 30,000 minimum return required, resulting in the negative of ₹ 5,000 residual income.

(iv) Opportunity to sell additional 10,000 unit :

Particulars	Original Budget (₹)	Additional Budget (₹)	Total (₹)
Sales	4,00,000	75,000	4,75,000
Less: Variable cost	3,00,000	60,000	3,60,000
Contribution	1,00,000	15,000	1,15,000
Less: Fixed costs	75,000	5,000	80,000
Divisional profit	25,000	10,000	35,000
Less: Cost of capital (20%)	30,000	4,000	34,000
Residual Income	(5,000)	6,000	1,000

The target residual income changes from a negative balance of ₹ 5,000 to a positive one of ₹ 1,000 as a result of the new opportunity to sell 10,000 units. This is due to the fact that ₹ 10,000 expected profit from additional order is offset by a further ₹ 4,000 cost of capital, thereby increasing residual income by ₹ 6,000.

3. Eileen Kunselman, president of Phoenix Electronics (PE), is concerned about the prospects of one of its major products. The president has been reviewing a marketing report with Jeff Keller, marketing product manager, for their 10-disk car compact disk (CD) changer. The report indicates another price reduction is needed to meet anticipated competitors' reduction in sales price. The current selling price for their 10-disk car CD changers is ₹ 3,500 per unit. It is expected that within three months PE's two major competitors will be selling their 10-disk car CD changers for ₹ 3,000 per unit. This concerns Kunselman because their current cost of producing the CD changers is ₹ 3150 which yields a ₹ 350 profits on each unit sold.
The situation is especially disturbing because PE had implemented an activity based costing (ABC) system about two years ago. The ABC system helped them better identify costs, cost pools, cost drivers, and reduce costs. Changes made when adopting ABC reduced costs on this product by approximately 15 percent during the last two year Now it appears cost will need to be reduced considerably more to remain competitive and to earn a profit on the 10-disk car CD changer Total costs to produce, sell, and service the CD changer unit are as follows.

10-disk Car CD Changer

		Per Unit (₹)
Materials:	Purchased components	1,100
	All other materials	400
Labour:	Manufacturing, direct	650
	Setups	90
	Material handling	180
	Inspection	230
Machining:	Cutting, shaping, and drilling	210
	Bending and finishing	140
Other:	Finished goods warehousing	50
	Warranty	100
	Total unit cost	3,150

Kunselman has decided to hire Donald Collins, a consultant, to help decide how to proceed. After two weeks of review, discussion, and value engineering analysis,

collins suggested that PE adopt a just-in-time (JIT) cell manufacturing process to help reduce costs. He also suggested that using target costing would help in meeting the new target price.

By changing to a JIT cell manufacturing system, PE expects that manufacturing direct labour will increase by ₹ 150 per finished unit. However, setup, material handling, inspection, and finished goods warehousing will all be eliminated. Machine costs will be reduced from ₹ 350 to ₹ 300 per unit, and warranty costs are expected to be reduced by 40 percent.

Required:

(i) Define "Target Costing."

(ii) Determine Phoenix Electronics' unit target cost at the ₹ 3,000 competitive sales price while maintaining the same percentage of profit on sales as is earned on the current ₹ 3,500 sales price.

(iii) If the just-in-time (JIT) cell manufacturing process is implemented with the changes in costs noted above, will Phoenix Electronics meet the unit target cost you determined in Requirement B above? Prepare a schedule detailing cost reductions and the unit cost under the proposed JIT cell manufacturing process.

Answer of 3:

(i) Target costing is a method of determining the allowable cost of a product or service. The allowable cost or target cost is an estimated long-run cost of a product or service that when sold will yield a target profit. Normally, the target sales price is determined first; this is generally equal to or less than the competitive market price of the product or service. The target profit is then deducted, leaving the target cost of production to earn the desired (normal) profit.

(ii) Phoenix Electronics' current profit on sales is 10 per cent [(₹ 3500 - ₹ 3150)/₹ 3500]. Therefore, the target cost for the new product must be ₹ 3,000 less 10 percent, or ₹ 2,700 [₹ 3000-(₹ 3000 x 10%)]

(iii) The proposed changes to the just-in-time (JIT) cell manufacturing process at Phoenix Electronics will bring costs down to ₹ 2,660 per unit, which is below the ₹ 2700 target cost limit.

Adjusted costs under the JIT cell manufacturing process are calculated below.

Particulars	Current (₹)	Increase /(Decrease)(₹)	Revised (₹)
Materials			
Purchased components	1,100		1,100
All other	400		400
Labour			
Manufacturing direct	650	150	800
Setups	90	(90)	-
Material handling	180	(180)	-
Inspection	230	(230)	-
Machining			
All	350	(50)	300
Other			
Finished goods warehousing	50	(50)	-
Warranty*	100	(40)	60
Total JIT Cost	**3,150**	**(490)**	**2,660**

*40% reduction

4(a) Vasax & co. provides you with the following as at 31st March,2013.

Liabilities	Amount (₹ in lakhs)	Assets	Amount (₹ in lakhs)
Share Capital 981.46 Reserve and surplus 1,313.62	2,295.08	Fixed Assets (Net)	2,409.90
Long term debt	144.44	Current Assets	50.00
Sundry Creditors	20.38		
Total	2,459.90	Total	2,459.90

Additional Information provided is as follows:
(i) Profit before interest and tax is ₹ 2,202.84 lakhs.
(ii) Interest paid is ₹ 13.48 lakhs.
(iii) Tax Rate is 40 % (say)
(iv) Risk free Rate = 11.32%
(v) Long term Market Rate = 12%
(vi) Beta (β) = 1.62 (highest during the period)
You are required to calculate Economic Value Added of Vasax & co.

(b) Why is Customer Satisfaction Important?

(c) Describe the objectives of Customer Relationship Management.

Answer of 4:

(a) EVA= NOPAT – Weighted average cost of capital x Capital employed

EVA= Economic value added

NOPAT= Net operating profit after tax

Weighted Average Cost of Capital (WACC)

$$= \frac{E}{CE} \times K_e + \frac{P}{CE} \times K_p + \frac{LTD}{CE} X K_d$$

Where, E = Equity; P = Preference Share; LTD = Long Term Debt; CE = Capital Employed.

K_e (Cost of Equity) $= R_F + \beta (R_m - R_F)$

Where, R_F = Risk Free Rate = 11.30%

R_m = Return on market index = 12%

β = 1.62

$\therefore$ K_e = 11.32% + 1.62 (12% - 11.32%)

= 11.32% + 1.10% = 12.42%

K_d (Cost of Debt) $= \frac{\text{Interest}\,(1-\text{Tax Rate})}{\text{Debt}} \times 100$

$$= \frac{₹13.48\,\text{lakhs}\,(1-0.4)}{₹144.44\ \text{lakhs}} \times 100$$

= 5.6%

$\therefore$ $WACC = \frac{E}{CE} \times K_e + \frac{P}{CE} \times K_p + \frac{LTD}{CE} X K_d$

$$= \frac{2,295.08^*}{(2,439.52^{**})} \times 12.42\% + 0 + \frac{144.44}{2,439.52} \times 5.6\%$$

= 11.69% + 0.33% = 12.02%

NOPAT = Profit BIT – Interest – Tax

= ₹ 2,202.84 lakhs – 13.48 lakhs – (2,189.36 x 0.40)

= ₹ 2,202.84 lakhs – 13.48 lakhs – 875.74 lakhs

= 1,313.62 lakhs

∴ EVA = NOPAT – WACC x CE
= ₹ 1,313.62 lakhs – (12.02% x 2,439.52 lakhs)
= ₹ 1,313.62 lakhs – ₹ 293.23 lakhs = ₹ 1,020.39 lakhs

Alternatively, EVA can be computed as follows:

EVA = Spread x Capital Employed
Spread = Return – WACC
Return = (1,313.62 ÷ 2,439.52) x 100 = 53.8447%
Spread = 53.847% - 12.02% = 41.827%
∴ EVA = ₹ 2,439.52 lakhs x 41.827%
= ₹ 1,020.38 lakhs

Note:

*981.46+1,313.62 = 2,295.08 lakhs

** 2,295.08 + 144.44 = 2,439.52 lakhs (Opening balance are not given for computation of Capital employed)

(b) Superior customer satisfaction affects bottom line:

- Increased customer loyalty
- Greater pricing leverage
- Increased sales
- Increased usage
- Competitive advantage
- Superior operating results
- Increased financial performance
- Increased market share

(c) Objectives of using CRM Applications, defined in the following line:

(i) To support the customer services.
(ii) To increase the effectiveness of direct sales force.
(iii) To support of business to business activities.
(iv) To support of business to consumer activities.
(v) To manage the call center.
(vi) To operate the In- bound call centre.
(vii) To operate the Out - bound call centre.
(viii) To operate the Full automated (i.e. no CRM involvement, "lights out")

5 (a) Explain the advantages and benefits of Customer Relationship Management.
(b) Describe the advantages and disadvantages of Return on investment.
(c) Discuss the different types of Benchmarking.

Answer of 5:

(a) Competition is very sharp in current market. Companies must take care of a customer in every area of their specialization by using various communication channels. Customer expects perfect services whether he calls a help line, asks a dealer, browses a web site or personally visits a store. It is necessary to assure him in a feeling that he communicates with the same company whatever form of communication, time or place he chooses. According to Matušinská the basic advantages and benefits of CRM are these:

- Satisfied customer does not consider leaving
- Product development can be defined according to current customer needs
- A rapid increase in quality of products and services
- The ability to sell more products
- Optimization of communication costs

- Proper selection of marketing tools (communication)
- Trouble-free run of business processes
- Greater number of individual contacts with customers
- More time for customer
- Differentiation from com petition
- Real time access to information
- Fast and reliable predictions
- Communication between marketing, sales and services
- Increase in effectiveness of teamwork
- Increase in staff motivation

Advantages and benefits are almost endless. Unfortunately some negatives exist. One of them is the fact that proper implementation and running of CRM is very difficult (technology, people – employees, initial money investment etc.), another one is the safety of information that companies keep about their customers, sharing information with third party and its overall protection. The entire operating principle of CRM (gathering information, recording calls, analyzing all clients' activities etc.) is invasion of privacy of customers.

(b) Advantages of Return on Investment:

ROI has the following advantages

(i) It relates net income to investments made in a division giving a better measure of divisional Profitability.

(ii) It can be used as a basis for other ratios which are useful for analytical purposes.

(iii) It is easy to understand as it is based on financial accounting measurements.

(iv) It may be used for inter firm comparisons, provided that the firms whose results are being compared are comparable size and the same industry.

Disadvantages of Return on Investment:

ROI has the following limitations:

(i) Satisfactory definition of profit and investment are difficult to find. Profit has many concepts such as profit before interest and tax, profit after interest and tax, controllable profit, profit after deducting all allocated fixed costs. Similarly, the term investment may have many connotations such as gross book value, net book value, historical cost of assets, and current cost of assets, assets including or excluding intangible assets.

(ii) While comparing ROI of different companies it is necessary that the companies use similar accounting policies and methods in respect of valuation of stocks, valuation of fixed assets, apportionment of overheads, treatment of research and development expenditure etc.

(iii) ROI may influence a divisional manager to select only investments with high rates of return (i.e. rates which are in line or above his target ROI). Other investments that would reduce the division's ROI but could increase the value of the business may be rejected by the divisional manager. It is likely that another division may invest the available funds in a project that might improve its existing ROI (which may be lower than a division's ROI which has rejected the investment) but which will not contribute as much to the enterprise as a whole. These types of decisions are sub-optimal and can distort an enterprise's overall allocation of resources and can motivate a manager to make under investing in order to preserve its existing ROI.

(c) There are different types of benchmarking, each of which is targeted at a different part of a company's operations.

(i) Product Benchmarking

This type of benchmarking uses comparison between company's own products or services and those of other organizations. The focus of such studies tends to be on quality, reliability and features of comparable products. It does not mean that benchmarking comparisons are confined to products created by companies in the same industry, since products can be broken down into their component parts, which may individually be more readily compared with components of products from other industries. Product benchmarking can be performed even without the approval of another company, since one can simply buy its products and directly review them through reverse engineering or feature comparisons.
When Ford Motor Company redesigned the Tauras in 1992, it benchmarked 209 features on the car against 7 competitors. The company then worked to match / excel the higher standard set by any of its rival, in each of these features with its own product.

(ii) Competitive Benchmarking

A Measure of organizational performance compared against competing organization; studies the target specific product designs, process capabilities or administrative methods used by a company's direct competitors.

Competitive Benchmarking moved beyond product oriented comparisons to include comparisons of process with those of competitors. In this benchmarking, the process studied may include marketing, finance, human resource, R & D etc. A typical example would be the classical study the Rank Xerox performed with those of Canon and other photo copier manufacturers when it faced heightened competition from US and Japanese companies. By benchmarking Rank Xerox achieved significant performance improvements as given below:

- Unit manufacturing cost reduced to half; comparable to 1980 product costs
- Machine defects have improved by over 90%
- Incoming parts acceptance has improved to 99.5%
- Inventory methods of supply reduced by at least two thirds.
- Engineering drawings per person year more than doubled
- Marketing Productivity improved by one third.
- Service labour cost reduced by 30%
- Distribution productivity increased from 5% to 10%

Management Accountants are familiar with the technique of inter firm comparison of financial performance of companies through ratios to draw meaningful inferences. For instance Hindalco's power cost is lowest in the world, due to the captive power plant set up by them long back. Other aluminum producers while endeavoring to move closer to this standard must improve in other areas to have competitive parity.

(iii) Process Benchmarking

It involves comparison of critical business processes and operations against best practices of market leaders.

The activity of measuring discrete performance and functionality against organizations through performance in excellent analogous business processes.

To gain leadership position it is essential to look at a paradigm-shifting jump to a new way of managing a process; for this you may have to go beyond your industry and look at the "best-inbreed" to bring about a fundamental change and not just an incremental improvement.

When Airlines wanted to improve their turnaround times they compared the performance with the Pit Crew of **Formula I races** since it is well known that they are best in class in that operation. Hospitals in U.S. compare their patient management systems with the guest management practice in hotels. American Express credit card division compares its document handling process with that of a courier company.

(iv) Internal Benchmarking

An application of process benchmarking performed, within an organization by comparing the Performance of similar business units or business processes. Examples of processes subject to benchmarking are the sale cycle, procurement cycle, which make up the primary ongoing operations needed to run a company. The sale cycle involves taking orders from customers, scheduling them for production, manufacturing them, shipping the products, issuing billings and processing cash receipts. The procurement cycle involves placing purchase requisition, searching for suppliers, negotiating with suppliers, placing purchase orders, accepting deliveries, processing rejected goods, processing billing paperwork and issuing payments to suppliers. These two processes comprise the bulk of most companies operations, though there are certainly many ancillary processes that can also be subject to benchmarking study. Comparisons can be made with companies from markedly different industries since processes are readily adaptable across many industries. When processes are the subject of benchmarking, the usual justification is that there will be immediate financial results. Benchmarking can also achieve shorter processing intervals, which are readily measured.

Hewlett Packard through an extensive internal benchmarking exercise on the Best Scheduling Practice amongst its several product groups was able to cut its "time-to-market" by half. For a company like HP introduction of new products in time was a crucial performance metric. McKinsy study has shown that hi-tech products that came on budget, but six months behind schedule, sacrificed 33% of their potential profit over the first five years in the market. It might interest Management Accountants to know that the same study showed that on time project that were 50% over budget lost only 4% of the profits over the same period.

(v) Strategic Benchmarking

The application of process benchmarking of the level of business strategy; a systematic process for evolving alternatives, implementing strategies, and improving performance by understanding and adapting successful strategy from external partners who participated in an on-going business alliance.

Under this type of benchmarking, the review team wishes to discern, if there are other ways to position the company within its industry, that have not been considered but which organizations are implementing with success. It may also require looking at other industries, since the industry, within which a company competes, may be full of organizations, that all have the same strategic mind-set and, therefore, are not a good source of information. This type of review leads to only short-term improvements, since strategic changes typically require several years of effort to implement. Only much forward looking management team tends to engage in this type of benchmarking.

In mid 1980's When Jack Welch of General Electric wanted to position his company for the coming decade, he asked his Strategic Planning Group to study how successful companies positioned themselves for continuous improvement. The results of the study provided operating definitions of a company that is World Class.

- It is one which knows it process better than its competitors knows their processes.
- Knows its industry competitors better than its competitors
- Knows its customers better than its competitors.
- Responds more rapidly to customer behavior than competitors do
- Competes for market share on a customer by customer basis.

The lessons learnt and successfully applied by G.E. resulted in its pole vaulting itself as the premier world organization.

GE applied benchmarking in the area of strategy which clearly shows the contribution of macro level benchmarking for developing long range plans. When Hindustan Lever Ltd., planned to penetrate into rural areas, it benchmarked its rural market against manufacturer.

(vi) Global Benchmarking

Globalization and advances in information technology leads to use this type of benchmarking. It means understanding international culture, business processes and trade practices for business process improvement.

When Larsen & Toubro Ltd., the engineering and construction powerhouse wanted to enter the world market for projects, it deemed it fit to benchmark its project management skills with global rivals, Bechtel and Flour Daniel Corporation of US, assisted by McKinsy Co., Draughtsman were benchmarked for their CAD/CAM proficiency as well as their ability to handle bill of materials. Once gaps were identified, L & T used a combination of training and external recruitment to close them.

There are other types of Benchmarking:

(vii) Functional Benchmarking:

An application of process benchmarking that compares a particular business function at two or more organizations.

(viii) Generic Benchmarking:

An application of functional process benchmarking that compares a particular business function at two or more organizations, selected without regard to their industry.

6. Read the following caselets and answer the following questions:

(a) Triton Industries

The operating divisions of Triton Industries are evaluated on several performance measures, one of which is operating income. Triton's corporate overhead is allocated to the divisions on the basis of each division's revenue, and this allocation is included in the calculation of operating income. The information given in the chart below is available for the first quarter of 2013.

Triton Industries
First Quarter 2013

Particulars	Bicknell Division (₹)	Norton Division (₹)	Driscoll Division (₹)	Total (₹)
Revenues	23,04,000	32,40,000	16,56,000	72,00,000
Cost of goods sold	8,64,000	16,84,800	8,10,000	33,58,800
Gross margin	14,40,000	15,55,200	8,46,000	38,41,200
Division overhead	2,20,000	4,30,000	1,90,000	8,40,000
Corporate overhead	5,12,000	7,20,000	3,68,000	16,00,000
Division operating income	7,08,000	4,05,200	2,88,000	14,01,200

The manager of the Norton Division has been carrying a line of products that are marginally profitable but use facilities that would otherwise be idle. This product line is scheduled to be replaced over the next two years: but, in view of the first quarter's results, the manager is considering dropping the line immediately. The first quarter accounting data for this product line are as follows:

Particulars	Amount (₹)
Revenues	6,00,000
Cost of goods sold	5,00,000
Avoidable division overhead	1,00,000

Required:

1. **Prepare a revised operating income statement for Triton Industries assuming that the manager of the Norton Division had stopped the sale and production of the marginally profitable product line at the beginning of the quarter, and**
2. **Discuss whether or not Triton Industries' measure of division profitability is encouraging behavior that is beneficial to all parties.**

(b) Rite Auto Shops

The owners of Rite Auto Shops stress customer satisfaction and speedy repairs. The mechanics are paid a base hourly wage of ₹ 25 plus piece-work incentives based on standard times and the type of job. For example a brake adjustment is estimated to take 90 minutes and has a work incentive of ₹10 if the adjustment is completed within 90 minutes. The company has recently started measuring customer satisfaction through the use of surveys and the monitoring of customer complaints.

Required:

Evaluate the mechanics compensation plan at Rite Auto Shops by

1. **Describing the likely behaviour of the mechanics.**
2. **Recommending improvements to the plan.**

(c) Ashton Corporation

Ashton Corporation recently announced a bonus plan to award the manager of the most profitable division. The three division managers are to choose whether return on investment (ROI) or residual income (RI) will be used to measure profitability. In addition, they must decide whether investment will be measured using gross book value or net book value. The following information is available for the year just ended.

Division	Gross Book Value of Assets (₹)	Division Operating Income (₹)
Bristol	8,00,000	95,000
Darden	7,60,000	92,000
Gregory	5,00,000	61,600

All assets were purchased four years ago and have four years of useful life remaining. Ashton uses straight-line depreciation with no salvage value and an imputed interest charge for calculating residual income of 10 percent of investment.

Required:

1. **Each division manager of Ashton Corporation has selected a method of bonus calculation that places his or her division in first place. Identify the method for calculating profitability that each manager selected, supporting your answer with appropriate calculations.**

Answer of 6:

(a) 1. A revised income statement for Triton Industries, prepared on the assumption that the manager of Norton Industries had discontinued the sale and production of the marginally profitable product line at the beginning of the quarter, is presented below.

Triton Industries
Statement of Income for the 1st Quarter Ended, 2013

	Bicknell Division (₹)	Norton Division (₹)	Driscoll Division (₹)	Total (₹)
Revenues	23,04,000	26,40,000[2]	16,56,000	66,00,000
Cost of goods sold	8,64,000	11,84,800[2]	8,10,000	28,58,800
Gross margin	14,40,000	14,55,200	8,46,000	37,41,200
Division overhead	2,20,000	3,30,000[2]	1,90,000	7,40,000
Corporate overhead[1]	5,60,000	6,40,000	4,00,000	16,00,000
Division Operating Income	6,60,000	4,85,200	2,56,000	14,01,200

Notes:

(1) Reallocation of corporate overhead based on the percentages to total revenue assuming discontinuance of Norton Division marginal product line.

₹23,04,000 ÷ 66,00,000 = 35% x Rs. 16,00,000 = ₹5,60,000
₹26,40,000 ÷ 66,00,000 = 40% x Rs. 16,00,000 = ₹6,40,000
₹16,56,000 ÷ 66,00,000 = 25% x ₹16,00,000 = ₹4,00,000

(2) Restatement of Norton Division financial data assuming discontinuance of marginal product line.

Revenue	₹32,40,000	-	₹6,00,000	=	₹26,40,000
Cost of goods sold	₹16,84,800	-	₹5,00,000	=	₹11,84,800
Division overhead	₹4,30,000	-	₹1,00,000	=	₹3,30,000

2. Triton Industries' measure of division profitability is not encouraging behaviour that is beneficial to all parties for the following reasons.

- The measure is dysfunctional since the divisions are being penalized for increasing revenues. Managers will be demotivated and behave in a manner that will not benefit the firm over time.
- The allocation of corporate overhead on the basis of division revenues is inappropriate since revenues are not the drivers of corporate overheads.

(b) 1. Rite Auto Shops current compensation plan encourages mechanics to complete the job in less than the standard amount of time. In order to earn the incentive, mechanics are in effect being encouraged to ignore job quality, take short cuts by not performing all specified functions, and focus on time only. Their behaviour will likely be to work rapidly to outperform the standard time per job without regard to quality or customer satisfaction.

2. A more congruent plan would be to base the compensation on customer satisfaction and quality as well as timeliness of job completion. While quality and customer satisfaction are difficult to measure precisely, they can be determined through customer surveys, customer complaints, and quality inspections by supervisors, etc.

(c) 1.

ASTHON CORPORATION
Calculation of Residual Income (RI)
and Return on Investment (ROI)
for Each Corporate Division
(₹ in thousands)

Residual income (RI) calculations

Gross Book Value

Division	Operating Income (₹)	Gross Book Value (₹)	Capital Charge @ 10% (₹)	Residual Income GBV (₹)
Bristol	95.0	800.0	80.0	15.0
Darden	92.0	760.0	76.0	16.0(1)
Gregory	61.6	500.0	50.0	11.6

Net Book Value

Division	Operating Income (₹)	Net Book Value (₹)	Capital Charge @ 10% (₹)	Residual Income NBV (₹)
Bristol	95.0	400.0	40.0	55.0(2)
Darden	92.0	380.0	38.0	54.0
Gregory	61.6	250.0	25.0	36.6

Return on investment (ROI) calculations

Gross Book Value

Division	Operating Income (₹)	Gross Book Value (₹)	Return on Investment GBV
Bristol	95.0	800.0	11.88%
Darden	92.0	760.0	12.11%
Gregory	61.6	500.0	12.32%(3)

Net Book Value

Division	Operating Income (₹)	Gross Book Value (₹)	Accumulated Depreciation (₹)	Net Book Value (₹)	Return on Investment NBV
Bristol	95.0	800.0	400.0	400.0	23.75%
Darden	92.0	760.0	380.0	380.0	24.21%
Gregory	61.6	500.0	250.0	250.0	24.64%(3)

Notes:

(1) The Darden Division selected the residual income [RI] method based on gross book value (GBV) as it placed the division first with an RI of ₹16,000.

(2) The Bristol Division selected the RI method based on net book value (NBV) as it placed the division first with RI of ₹55,000.

(3) The Gregory Division selected the return on investment (ROI) method based on either GBV or NBV as both methods placed the division in first place.

7. (a) Explain the role of Cost Accountant Role in Target Costing Environment.
(b) How can Value Chain Analysis be used to assess Competitive Advantage?
(c) Discuss the characteristics Business Process Re – Engineering.

Answer of 7:

(a) The role of a Cost Accountant in a Target Costing Team consists of the following activities

1. **Cost Estimation**: To provide other members of the design team a running series of cost estimates based on initial designs sketch, activities based costing reviews of production processes, and "best guess" costing information from suppliers based on estimated production volumes.

2. **Permissible Cost Ranges**: To provide estimates within a high-low range cost, since preliminary data may be vague. But, the estimated cost range should be modified as more information becomes available.

3. **Capital Budgeting Analysis**: To cater to capital budgeting requests generated by the design team based on types of equipment needed for the anticipated product design, product revenues and costs, rates of return etc, and to answer questions regarding uncertainties and risk analysis.

4. **Cost Principles Explanation**: To work with the design team to help it understand the nature of various cost (such as cost allocations based on an Activity- Based Costing system), as well as the cost-benefit trade-offs of using different design or cost pertains in the new product.

5. **Review of Cost reduction Targets**: To track the gap between the current cost and the target cost that is the design team's goal, providing an itemization of where cost savings have already been achieved and where there has not been a sufficient degree of progress.

6. **Final Review and Feed back**: To compare a product' actual cost to the target cost after the design is completed, and for as long as the Company sells the product. This is necessary since Management must know immediately if costs are increasing beyond budgeted levels and why these increases are occurring.

(b) A Company can gain competitive advantage not just by matching or surpassing its competitors, but discovering what the customers want and then profitably satisfying, and even exceeding, customer expectations. This is done by a concept called Value Chain Analysis (VCA).

VCA can be used to better understand which segments, distribution channels, and price Points, product differentiation; selling propositions and Value Chain configurations will yield the Firms the greatest competitive advantage.

Use of VCA to assess competitive advantage involves the following analyses -

(i) **Internal Cost Analysis** - to determine the sources of differentiation (including the cost) within internal value-creating processes; and

(ii) **Internal Differentiation Analysis** - to understand the sources of differentiation (including the cost) within internal value-creating processes; and

(iii) **Vertical Linkage Analysis** - to understand the relationships and associated costs among external suppliers and customers in order to maximize the value delivered to customers and to minimize cost.

The following actions and steps are involved in the above analyses –

Stage	Description
1	**Internal Cost Analysis:** • Identify the Firm's value-creating processes. • Determine portion of the total cost of the product or services attributable to each value-creating process.

	• Identify the Cost Drivers for each process. • Identify the links between processes • Evaluate the opportunities for achieving relative cost advantage.
2	**Internal Differentiation Analysis:** • Identify the customers' value-creating processes. • Evaluate differentiation strategies for enhancing customer value. • Determine the best sustainable differentiation strategies.
3	**Vertical Linkage Analysis:** • Identify the industry's Value Chain and assign costs, revenues and assets to value-creating processes. • Diagnose the Cost Drivers for each value-creating process. • Evaluate the opportunities for sustainable competitive advantage.

Features of these analyses:

(i) Not mutually exclusive: Firms begin by focusing on their internal operations and gradually widening their focus to consider their competitive position within their industry.

(ii) Continuous: VCA is a continuous process of gaining competitive advantage, not a one-time affair.

(iii) Part of Strategic Planning: VCA is a process of gathering, evaluating and communicating information for business decision-making.

(c) Characteristics:

(i) Several jobs are combined into one
(ii) Often workers make decisions
(iii) The steps in the process are performed in a logical order
(iv) Work is performed, where it makes most sense
(v) Quality is built in.
(vi) Manager provides a single point of contact
(vii) Centralized and decentralized operations are combined.

8. Eastern Switching Co. (ESC) produces telecommunications equipment. In recent years, the company has lost considerable market share to foreign competition and to several new domestic companies. Product quality is the primary factor that gives one company a competitive advantage over another. A reputation for reliability and for meeting customer specifications is often the determining factor in a sale, even when the price is higher.

Charles Laurent, ESC's president, decided to implement a company-wide quality improvement programme. He believes that the company's survival depends on improving product quality, and that the way to accomplish this is to adopt the philosophy and techniques of total quality management (TQM). Laurent's goal is to make ESC a world-class manufacturer and to become the best in the industry in terms of product quality and service.

Philip Larkin, ESC's vice president of operations, is concerned that the attempt to implement this programme will cause productivity to decline and costs to increase. He views "quality" as an abstract idea without measurable characteristics. To him, quality programmes are just executive slogans that lead to employee discussion groups and that slow down production.

Required:

(a). In general, identify and discuss at least three factors that will help an organization to successfully implement a quality improvement program.

(b) Define and briefly discuss the following quality related terms.

1. Total quality management (TQM).

2. Competitive benchmarking.

(c) Discuss Philip Larkin's concern at Eastern Switching Co. that quality programmes only decrease productivity and increase costs.

Answer of 8 :

(a) At least three factors that will help an organization to successfully implement a quality programme include:

- Resource commitments to help increase employee empowerment. If the funds and personnel are not committed, the programme will probably fail.
- An accounting system that identifies quality costs. Knowing the costs of poor quality motivates change and provides a means for measuring improvement.
- An organizational culture change as the entire company needs to be focused on the customer.

(b) 1. Total quality management (TQM) is a strategic commitment by top management to completely focus the company's efforts toward continuously improving level of quality to the customer throughout the company's business processes and practices.

2. Competitive benchmarking is a continuous process of measuring a company's own products, services, processes, and practices against the best company in their class.

(c) Underlying Larkin's concern is the assumption that productivity can only be increased by decreasing quality. Larkin's concern is shortsighted as he is only considering the short-term costs and not the long-term benefits. The initial implementation of a quality programme will temporarily result in lost production time as employees are trained and become more involved in production problem-solving, but these costs prove to be sound investments in the long term. Internal and external failure costs decline and customer satisfaction increases. Experience has shown that quality leads to a decrease in the number of defects, which in turn leads to a decrease in the resources dedicated to rework and inspection. Customer returns, warranty costs, and customer lawsuits all decline. Moreover, the cost of future lost sales due to poor quality should decrease substantially.

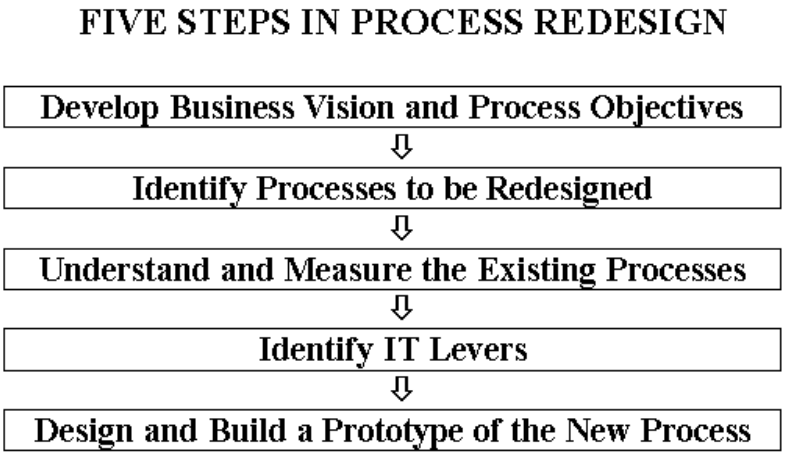
9 (a) "Assuming that a company has decided its processes are inefficient or ineffective, and therefore in need of redesign"- how should it proceed?-Discuss it.

(b) "Value analysis refers to the organizational processes which a firm uses in order to generate the specific ideas for closing the target costing gap" – Discuss it.

(c) What are the limitations of Value Chain Analysis?

Answer of 9 :

This is a straight forward activity, but **Davenport & Short (1990)** prescribe a five - step approach to BPR:



(i) Develop Business Vision and Process Objectives:

BPR is driven by a business vision which implies specific business objectives such as Cost Reduction, Time Reduction, Output Quality Improvement, Quality of Work life (QWL)/Learning/Empowerment.

(ii) Identify Processes to be Redesigned:

Most firms use the *High-Impact* approach which focuses on the most important processes or those that conflict most with the business vision. Lesser number of firms uses the *Exhaustive* approach that attempts to identify all the processes within an organization and then prioritize them in order of redesign urgency.

(iii) Understand and Measure the Existing Processes:

Understanding and measuring the existing processes before redesigning them is especially important, because problems must be understood so that they are not repeated. On the other hand, accurate measurement can serve as a baseline for future improvements.

(iv) Identify IT Levers:

In the broadest sense, all of IT's capabilities involve improving coordination and information access across organizational units, thereby allowing for more effective management of task interdependence. An awareness of IT capabilities can -and should- influence process design. Therefore, the role of IT in a process should be considered in the early stages of its redesign.

(v) Design and Build a Prototype of the New Process:

The actual design should not be viewed as the end of the BPR process. Rather, it should be viewed as a prototype, with successive iterations expected and managed. Key factors and tactics to consider in process design and prototype generation include using IT as a design tool, understanding generic design criteria, and creating organizational prototypes.

These prototypes of business process changes and organizational redesign initiatives, after agreement by owners and stakeholders, would be implemented on a pilot basis, examined regularly for problems and objective achievement, and modified as necessary. As the process approached final acceptance, it would be phased into full implementation.

(b) Value analysis refers to the organizational processes which a firm uses in order to generate the specific ideas for closing the target costing gap. Value analysis involves a "cross-functional team" subjecting a product (including its components,

distribution channels, etc.) to detailed scrutiny to determine the relationship between (1) cost, (2) the practical functionality of the product, and (3) the value of the product to the customer. An example of the difference between (2) and (3) is that (2) may be a list of the technical features of a product (not all of which every customer necessarily desires) while (3) refers to each customer's subjective assessment of what the product is worth to them and therefore what they would be willing to pay for it.

Even a fairly simple change to a product's design characteristics has implications for (1), (2) and (3). A simple example may a proposal to change the type of battery used in a Smartphone which is being developed. Such a change clearly has implications for the manufacturing cost of the Smartphone, for its technical functionality (e.g., the length of time which the phone can operate without needing to be recharged), and the value of the Smartphone to the customer (e.g., if the battery is unusually heavy than customer value is likely to be adversely affected).
The need for the value analysis team to be cross-functional in its composition arises from the need to understand the relationship between (1), (2) and (3) in assessing design changes. For example, the particular expertise of marketing staff is in understanding what product features is actually willing to pay money for. Production staff understands the practical difficulties of producing products with a particular design. (For example, in manufacturing metal-based products, manufacturing the item in a range of colours – rather than just one standard colour –typically slows down production and increases cost). The accountant's particular contribution is typically to keep the score – quantifying (insofar as possible) the cost and revenue implications of possible design modifications and assessing the likelihood that they will lead to the closing of the target cost gap.

(c) Value Chain Analysis is criticized on the following grounds –

(i) Non-availability of Data: Internal data on costs, revenues and assets used for Value Chain Analysis are derived from financial information of a single period. For long-term strategic decision-making, changes in cost structures, market prices and capital investments etc. may not be readily available.

(ii) Identification of Stages: Identifying stages in an industry's Value Chain is limited by the ability to locate at least one Firm that participates in a specific stage. Breaking a value stage into two or more stages when an outside Firm does not compete in these stages is strictly judgment.

(iii) Ascertainment of Costs, Revenues and Assets: Finding the Costs, Revenues and Assets for each Value Chain activity poses / gives rise to serious difficulties. There is no scientific approach and much depends upon trial and error and experimentation methods.

(iv) Identification of Cost Drivers: Isolating Cost drivers for each value-creating activity, identifying serious challenges.

(v) Resistance from Employees: Value Chain Analysis is not easily understandable to all employees and hence serious challenges.

(vi) Science vs. Art: Value Chain Analysis is not an exact science. It is more "art" than preparing precise accounting reports. Certain judgments and factors of analysis are purely subjective and differ from person to person.

10 (a) Bring out the contrasting features between Value Chain Analysis and Traditional Accounting Systems.

(b) Discuss the difference between Total Quality Management (TQM) and Business process Reengineering (BPR).

(c) Mentioning the Key principles in Target Costing.

Answer of 10:

(a) Differences between Traditional Management Accounting and Value Chain Analysis:

Particulars	Traditional Management Accounting	Value Chain Analysis
1. Focus	Internal.	External.
2. Perspective	Seeks cost reduction in "Value Added" process. i.e., Sale Price ***Less*** Cost of Raw Materials.	Seeks competitive advantage based on entire set of linked activities from suppliers to end-use customers.
3. Number of Cost Drivers	A Single Cost Driver is adopted. Cost is generally based on volume of production and sales.	Multiple Cost Drivers are adopted, i.e., - • **Structural Drivers** (e.g. scale, scope, experience, technology and complexity) • **Executional Drivers** (e.g. participative management and plant layout)
4. Use of Cost Driver	Application at the overall Firm level (Cost-Volume-Profit analysis).	A set of unique Cost Drivers is used for each value activity.
5.Cost Containment Philosophy	Seeks adhoc cost reduction solutions by focusing on variance analysis, performance evaluation based on financial and quantitative data.	View Cost Containment as a function of the cost drivers regulating each value activity. • Exploit linkages with Suppliers. • Exploit linkages with Customers. • Exploit process linkages within the Firm. • "Spend to save".
6. Cost Preferences	Focus on control of manufacturing costs.	Focus on gaining advantage and not only on cost control and reduction.
7. Nature of data	Internal Information.	External and internal information.
8.Benchmarking	Partially present. Inter-Firm comparison, if any, is generally restricted to financial and not operational information.	Focus on full-fledged benchmarking, "Learning from Competitors", but exploiting one's on strengths to gain advantage.
9. Insights for Strategic Decisions	Limited to some extent.	Identify cost drivers at the individual activity level, and develop cost/differentiate advantage either by controlling those driven better than competitors by reconfiguring the Value Chain; Quantify and assess "Supplier Power" and "Buyer Power", and exploit linkages with suppliers and buyers.

(b)Differences between Total Quality Management (TQM) and Business Process Reengineering (BPR)

Major Factor	TQM Approach	BPR
Senior Management Involvement	Hands-on initially, and becoming more reinforcement oriented	Hands-on, active involvement Throughout the effort.
Intensity of Team Member Involvement	Ongoing involvement on an as-needed, part-time basis	Ongoing involvement for a specified duration on a full-time basis
Improvement Goals	Focus on incremental improvements over a period of time	Focus on dramatic improvements in a short time frame
Magnitude of Organizational Change	Limited disruption to existing systems and structures	Radical changes to existing systems and structures
Breadth of Focus	Addresses narrowly defined work processes	Addresses processes that span entire business units
Use of Benchmark Data	Used after process improvement, to compare data	Used on front end, to assist with process selection
Dependence on Information Systems	Information systems used for data collection and interpretation	Information systems used as a central enabler with on-line access

(c) There are **six key principles** in Target Costing:

(i) Price – led costing (i.e. target price less desired mark-up = target costs);
(ii) Customer focus;
(iii) Focus on design of products and processes;
(iv) Cross- functional teams;
(v) Life cycle cost reduction; and
(vi) Value chain involvement

11(a) For the following pay-off matrix, find the value of the game and the strategies of players A and B using linear programming:

		Player B		
		1	**2**	**3**
Player A	**1**	**3**	**-1**	**4**
	2	**6**	**7**	**-1**

(b) Listing the comparative analysis of different phases in Product Life Cycle Costing.

(c) Write a short notes on the various analysis under ABM.

Answer of 11 :

(a) Since two of the entries in the pay-off matrix are negative, we shall add a constant, say 3, to each of the values, by which each one of them would become a positive value. The pay-off matrix then becomes as shown here:

		Player B		
		1	**2**	**3**
Player A	1	6	2	7
	2	9	10	1

Now, let x_1 and x_2 represent the probabilities with which A chooses strategies 1 and 2 respectively, while y_1, y_2, and y_3 be the probabilities in respect of B choosing strategies 1, 2 and 3.

From A's point of view, the problem is,

Minimize $\frac{1}{U} = x_1 + x_2$

Subject to
$6x_1 + 9x_2 \geq 1$
$2x_1 + 10x_2 \geq 1$
$7x_1 + x_2 \geq 1$
$x_1, x_2 \geq 0$

Where $X_1 = x_1/U$, and $X_2 = x_2/U$.
Similarly, from B's view point, the problem is,

Maximize $\frac{1}{V} = Y_1 + Y_2 + Y_3$

Subject to
$6Y_1 + 2Y_2 + 7Y_3 \leq 1$
$9Y_1 + 10Y_2 + Y_3 \leq 1$
$Y_1, Y_2, Y_3 \geq 0$

Where $Y_i = y_i/V$.

Now we shall solve the problem from B's point of view. The problem can be augmented by introducing slack variables S_1, and S_2 as follows:

Maximize $\frac{1}{V} = Y_1 + Y_2 + Y_3 + OS_1 + OS_2$

Subject to
$6Y_1 + 2Y_2 + 7Y_3 + S_1 = 1$
$9Y_1 + 10Y_2 + Y_3 + S_2 = 1$
$Y_1, Y_2, Y_3, S_1, S_2 \geq 0$

The solution is contained in Table 1to 3.
Table 1 Simplex Tableau 1: Non-optimal Solution

Basis		**Y_1**	**Y_2**	**Y_3**	**S_1**	**S_2**	**b_i**	**b_i/a_{ij}**
S_1	0	6	2	7	1	0	1	1/6
S_2	0	9*	10	1	0	1	1	1/9 ← Outgoing variable
c_j		1	1	1	0	0		
Solution		0	0	0	1	1		
Δ_j		1	1	1	0	0		
		↑						
		Incoming variable						

Table 2 Simplex Tableau 2: Non-optimal Solution

Basis		**Y_1**	**Y_2**	**Y_3**	**S_1**	**S_2**	**b_i**	**b_i/a_{ij}**
S_1	0	0	-14/3	19/3*	1	-2/3	1/3	1/19 ← Outgoing variable
Y_1	1	1	10/9	1/9	0	1/9	1/9	1
c_j		1	1	1	0	0		
Solution		1/9	0	0	1/3	0		
Δ_j		0	-1/9	8/9	0	-1/9		
			↑					
			Incoming variable					

Table 3 Simplex Tableau 3: Non-optimal Solution

Basis		Y_1	Y_2	Y_3	S_1	S_2	b_i	b_i/a_{ij}
Y_3	1	0	-14/19	1	3/19	-2/19	1/19	---
Y_1	1	1	68/57*	0	-1/57	7/57	2/19	3/34 ← Outgoing variable
c_j		1	1	1	0	0		
Solution		2/19	0	1/19	0	0		
Δ_j		0	31/57	0	-8/57	-1/57		

↑ Incoming variable

Table 4 Simplex Tableau 4: Optimal Solution

Basis		Y_1	Y_2	Y_3	S_1	S_2	b_i
Y_3	1	42/68	0	1	5/34	-1/34	1/17
Y_2	1	57/68	1	0	-1/68	7/68	3/34
c_j		1	1	1	0	0	
Solution		0	3/34	2/17	0	0	
Δ_j		-31/68	0	0	-9/68	-5/68	

The optimal values for Y_1, Y_2, and Y_3 are 0, 3/34 and 2/17, respectively. From these, we have $\frac{1}{V} = 0 + \frac{3}{34} + \frac{2}{17} = \frac{7}{34}$

Therefore, V = 34/7. Since a value 3 was added to the original pay-off values, the game value is equal to V – 3 or 34/7 – 3 = 13/7. Further, since $y_i = Y_iV$, we have $y_1 = 0 \times 34/7 = 0$, $y_2 = (3/34)\ (34/7) = 3/7$, and y3 = (2/17) (34/7) = 4/7.

The values of the duel variables X_1 and X_2 can be read from the Δ_j row of the Simplex Tableau 4. From this, $X_1 = 9/68$ and $X_2 = 5/68$. From these, 1/U = 9/68 + 5/68 = 7/34. Therefore, U = V = 34/7. Thus, $X_1 = (9/68)\ (34/7) = 9/14$ and $X_2 = (5/68)\ (34/7) = 514$.

The solution to the problem, therefore, is:

Players A		Players B		Value of Game
Strategy	Probability	Strategy	Probability	
1	9/14	1	0	13/7
2	5/14	2	3/7	
		3	4/7	

(b) A comparative analysis of these phases is given below:

Particulars	Introduction	Growth	Maturity	Decline
Phases	**I**	**II**	**III**	**IV**
Sales Volume	Initial stages, hence low.	Rise in sales levels at increasing rates.	Rise in sales levels at decreasing rates.	Sales level off and then start decreasing.
Prices of Products	High levels to cover initial costs and promotional expenses.	Retention of high level prices except in certain cases.	Prices fall closer to cost, due to effect of competition	Gap between price and cost is further reduced.
Ratio of promotion expenses to	Highest, due to effort needed to inform potential	Total expenses remain the same, while	Ratio reaches a normal % of sales. Such	Reduced sales Promotional efforts as the

sales	customers, launch products, distribute to customers etc.	ratio of S&D OH to sales is reduced due to increase in sales.	normal % becomes the Industry standard.	product are no longer in demand.
Competition	Negligible and Insignificant.	Entry of a large number of competitors.	Fierce Competition.	Starts disappearing due to withdrawal of products.
Profits	Nil, due to heavy initial costs	Increase at a rapid pace.	Normal rate of profits since costs and prices are normalized.	Declining profits due to price competition, new products etc.

(c) The various analyses under ABM are –

(i) Cost Driver Analysis: This identifies the factors that cause activities to be performed, in order to manage activity costs. An activity may be performed inefficiently due to a particular reason. Managers have to address this cost driver to correct the root cause of the problem.

(ii) Activity Analysis: It involves identification of the activities of the Firm and the activity centers (or activity cost pools) that should be used in an ABC system. Activity analysis also identifies Value Added (VA) and Non Value Added (NVA) activities. The number of activity centers is likely to change over time, as organizational needs for activity information evolve.

(iii) Performance Analysis: This involves the identification of appropriate measures to report the performance of activity centers or other organizational units, consistent with each unit's goals and objectives. This aims to identify the best ways to measure the performance of factors that are important to organizations, in order to stimulate continuous improvement.

12 (a) S Engineering Company is considering to replace or repair a particular machine, which has just broken down. Last year this machine costed ₹20,000 to run and maintain. These costs have been increasing in real terms in recent years with the age of the machine. A further useful life of 5 years is expected, if immediate repairs of ₹ 19,000 are carried out. If the machine is not repaired it can be sold immediately to realize about ₹5,000 (Ignore loss/gain on such disposal).

Alternatively, the company can buy a new machine for ₹49,000 with an expected life of 10 years with no salvage value after providing depreciation on straight line basis. In this case, running and maintenance costs will reduce to ₹14,000 each year and are not expected to increase much in real terms for a few years at least. S Engineering Company regards a normal return of 10% p.a. after tax as a minimum requirement on any new investment. Considering capital budgeting techniques, which alternative will you choose? Take corporate tax rate of 50% and assume that depreciation on straight line basis will be accepted for tax purposes also.

(b) List a few business applications of ABM.

(c) State the Rule of Dominance in the context of Game Theory.

Answer of 12:

(a) Evaluation of Alternative proposals

Alternative I: Repairs to Existing Machine:

Particulars		Amount (₹)
Cost of Repairs	19,000 x 50 / 100 = ₹9,500	2,506
Equivalent annual cost for 5 years	(9,500 / 3.791)	10,000
Add: Running and Maintenance cost p.a. net of tax	(20,000 x 50 / 100)	
Present value of cash outflows p.a.		12,506

Alternative II: Replace the Old Machine:

Particulars		Amount (₹)
Purchase cost of new machine		49,000
Less: Sale proceeds of old machine		5,000
Net cash outflow		44,000
Equivalent annual cost for 10 years	(44,000 / 6.145)	7,160
Add: Running and maintenance cost p.a. net of tax	(14,000 x 50 / 100)	7,000
		14,160
Less: Tax saving on depreciation		2,450
Present value of cash outflows p.a.		11,710

Analysis: From the above analysis it is observed that alternative II i.e., replacement of old machine with a new machine is more profitable, since the cash outflow p.a. will decrease by ₹796 (i.e., ₹12,506 – ₹11,710) if old machine is replaced with new machine.

(b) Business Applications of ABM

(i) Cost Reduction: ABM helps the Firm to identify opportunities in order to streamline or reduce the costs or eliminate the entire activity, especially NVA activities. It is useful in identifying and quantifying process waste, leading to continuous process improvement through continuous cost reduction.

(ii) Activity Based Budgeting: Activity based budgeting analyses the resource input or cost for each activity. It provides a framework for estimating the amount of resources required in accordance with the budgeted level of activity. Actual results can be compared with budgeted results to highlight (both in financial and non-financial terms) those activities with major discrepancies for potential reduction in supply of resources. It is a planning and control system, which supports continuous improvement.

(iii) Business Process Re-Engineering (BPR): BPR is the analysis and redesign of workflows and processes in a Firm, to achieve dramatic improvement in performance, and operational excellence. A business process consists of linked set of activities, e.g. purchase of materials is a business process consisting of activities like Purchase Requisition, Identifying Suppliers, preparing Purchase Orders, mailing Purchase Orders and follow up. The process can be reengineered by sending the production schedule direct to the suppliers and entering into contractual agreement to deliver materials according to the production schedule.

(iv) Benchmarking: It involves comparing the Firm's products, services or activities with other best performing organizations, either internal or external to the Firm.

The objective is to find out how the product, service or activity can be improved and ensure that the improvements are implemented.

(v) Performance measurement: Activity performance measures consist of measures relating to costs, time quality and innovation. For achieving product quality, some illustrative performance measures are:

Area	Measure
• Quality of purchased component	• Zero defects
• Quality of output	• Percentage yield
• Customer awareness	• No. of orders, no. of complaints

(c) This rule is applicable to a zero-sum game between two persons, with any number of strategies. For a pay-off matrix of large size, the rule of dominance can be applied to reduce the size by carefully eliminating rows and/or column prior to final analysis to determine the optimum strategy selection for each person.

In general the following rules are adopted:

(i) In a pay-off matrix if all the elements of any row (say ith) are less than or equal (i.e., <) to the corresponding elements of any other row (say jth), then the ith strategy is dominated by jth row; in other words the player (or person) A will ignore or reject the ith row. Thus the pay-off matrix is reduced.

(ii) In a pay-off matrix if all the elements of any column (say rth) arc greater than or equal to (i.e. >) to the corresponding elements of any other column (say sth) then the rth strategy is dominated by s-th strategy; in other words the player B will ignore or reject the r-th strategy, hence again the pay-off matrix is reduced.

(iii) A pure strategy may be dominated if it is inferior to the average of two or more other pure strategies.

13 (a) Discuss the principles of Lean.
(b) "As a company reduces these wastes and strives for single piece flow, many other benefits will follow." – Describe it in the perspective of Lean Management.
(c) State the uses of Process Maps.

Answer of 13:

(a) The five-step thought process for guiding the implementation of lean techniques is easy to remember, but not always easy to achieve:
(i) Specify value from the standpoint of the end customer by product family.
(ii) Identify all the steps in the value stream for each product family, eliminating whenever possible those steps that do not create value.
(iii) Make the value-creating steps occur in tight sequence so the product will flow smoothly toward the customer.
(iv) As flow is introduced, let customers pull value from the next upstream activity.
(v) As value is specified, value streams are identified, wasted steps are removed, and flow and pull are introduced, begin the process again and continue it until a state of perfection is reached in which perfect value is created with no waste.

(b) The benefits of the Lean Management are:
(1) Improved quality and fewer defects: When batching and lot production are eliminated, there is less opportunity to manufacture defects. Since the batch size

will be just 1, there will not be mountains of inventory to count, move, store and pick.

Furthermore, single piece flow ensures that if there is a quality problem, we know that the defect has affected only that single part. We do not need to dedicate hours isolating and testing other material in the same production run to determine if it meets quality standards.

(2) Reduced Inventory: Implementing single piece flow will require each operation to only produce what is needed by the next operation (in Lean jargon, we call this individual the *surgeon*). When followed properly, the process will eliminate any opportunity to build ahead. Consequently, inventories will not be allowed to build up.

(3) Requires less space: As inventory levels are reduced, less space and manpower will be required to manage (receive, count, stock, store, pick and deliver) it. In addition, single piece flow usually results in manufacturing cells which squeeze machines close together so that a single operator can oversee many pieces of equipment with the least amount of walking motion.

(4) Enhances overall manufacturing flexibility: We know from our value steam maps that the less inventory in a value steam, the shorter the lead-time will be from customer order to product delivery. In a single piece flow environment, since we operate with fewer inventories, lead-times will also drop, thereby giving us more time to react to customer orders.

(5) Makes identifying future Kaizen simpler: We have already discussed that in a single piece flow environment, defects and WIP inventories fall. As this happens, the shop floor will open up and it will become easier to see production problems. For example, if a particular process cannot keep up with take time and WIP is not allowed to be incurred, it will quickly become apparent to even the casual observer that something is wrong. In this case, it will be easy to decide where to focus the next improvement activity.

(6) Ensures a safer work environment: Fewer inventories means less clutter, more light in the darkest corners of the factory and the opportunity to better lay out equipment and tools. Also, since manufacturing cells are occupied by a set number of employees who each know their repeating tasks (as defined by standard work), there is less opportunity for unexpected movements, which increase the chances of accidents.

(7) Improves employee morale: Since single piece flow results in production problems being identified and (hopefully) solved right away, team members will receive immediate feedback on their work.

This in turn will give everybody more ownership in their production area. Also, provided they lead problem solving efforts by focusing on processes and not individuals, more trust will be gained in managers.

(c) Process Maps are used to

- Document processes.
  - ✓ Provide a reference to discuss how things get done.
  - ✓ Describe and understand the work we do.
- Analyze and improve on processes.
  - ✓ Identify of areas of complexity and re-work.
  - ✓ To generate ideas for improvement.
  - ✓ Illustrate process improvements.

14 (a) Distinguish between ABC and ABM.

(b) Explain the Sub game Perfect Equilibrium.

(c) Explain the characteristics of Product Life Cycle.

Answer of 14:

(a) Difference between ABC and ABM:

Sl No.	ABC	ABM
1.	ABC refers to the technique of determining the cost of activities and the cost of output Produced by those activities.	It refers to the management philosophy that focuses on the planning, execution and measurement of activities as the key to competitive advantage.
2.	The aim of ABC is to generate improved cost data for use in managing a Company's activities.	ABM is a much broader concept and aims to use information given by ABC, for effective business processes and profitability.
3.	ABC is the operational segment of ABM.	It is a conceptual aspect, i.e. management attitude.

(b) Subgame Perfect Equilibrium:

Subgame perfection tries to rule out incredible threats by assuming that once something has happened, players will always optimize going forward.

Sub game Perfection:

Definition: Let G be an extensive form game, a sub game G' of G consists of (i) a subset Y of the nodes X consisting of a single non-terminal node x and all of its successors, which has the property that if $y \in Y$, $y' \in h(y)$ then $y' \in Y$, and (ii) information sets, feasible moves, and payoffs at terminal nodes as in G.

Entry Game, cont. In the entry game, there are two sub games. The entire game (which is always a sub game) and the sub game after Firm 2 has entered the market.

Example In game below, there are four sub games: (1) The entire game, (2) the game after player one chooses R, (3) the game after player one chooses L, and (4) the game after Player 1 chooses L and player 2 chooses1.

Definition: A strategy profile s is a **sub game perfect equilibrium** of G if it induces Nash equilibrium in every sub game of G.

Note that since the entire game is always a sub game, any SPE must also be a NE.
Entry Game, cont. In the entry game, only (A, in) is sub game perfect.

Definition: An extensive form game is said to have **perfect information** if each information set contains a single node.

Criticisms of Sub game Perfection

We motivated Sub game Perfection as an attempt to eliminate equilibrium that involved incredible threats.

As we go on to consider applications, we will use SPE regularly as a solution concept. Before we do this, however, it is worth pausing momentarily to ask whether SPE might be over-zealous in eliminating equilibrium

(c) The major characteristics of product life-cycle concept are as follows**:**

- The products have **finite lives** and pass through the cycle of development, introduction, growth, maturity, decline and deletion at **varying speeds.**

- Product cost, revenue and profit patterns tend to **follow predictable courses** through the product life-cycle. Profits first appear during the growth phase and after stabilizing during the maturity phase, decline thereafter to the point of deletion.
- **Profit per unit** varies as products move through their life-cycles.
- Each phase of the product life-cycle poses **different threats and opportunities** that give rise to different strategic actions.
- Products require **different functional emphasis** in each phase such as an R &D emphasis in the development phase and a cost control emphasis in the decline.

15 (a) A person has two independent investments A and B available to him; but he can undertake only one at a time due to certain constraints. He can choose A first and then stop, or if A is successful then take B or vice versa. The probability of success of A is 0.6 while for B it is 0.4. Both investments require an initial capital outlay of ₹ 10,000 and both return nothing if the venture is unsuccessful. Successful completion of A will return ₹ 20,000 (over cost) and successful completion of B will return ₹ 24,000 (over cost). Draw decision tree and determine the best strategy.

(b) Describe Sensitivity Analysis for measuring risks.

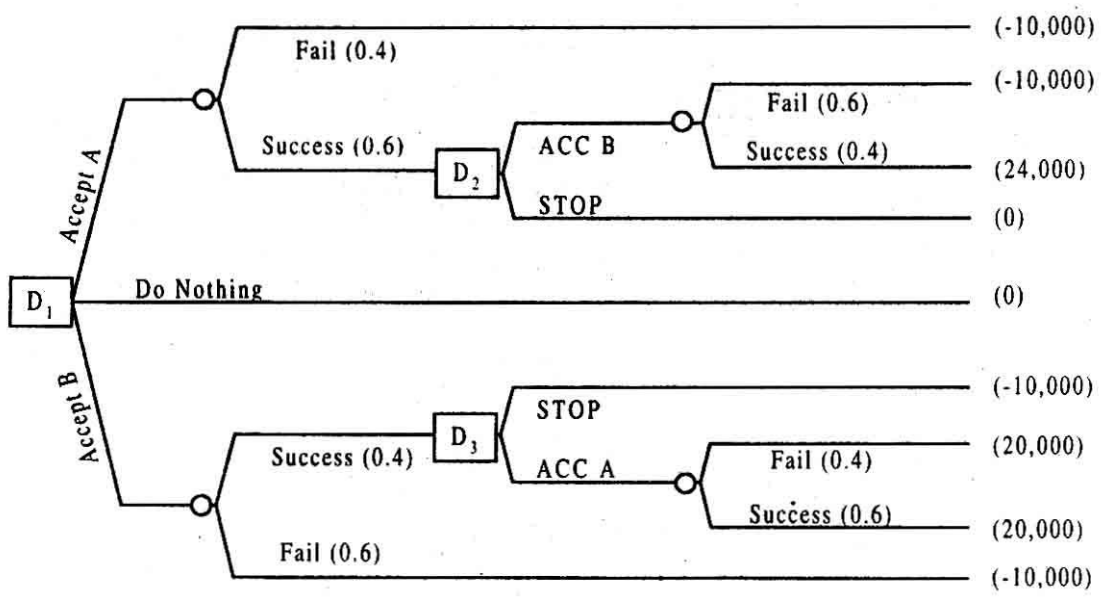
(c) Pay offs of three acts A, B and C and states of nature X, Y and Z are given below

Payoff (in ₹)

Acts ⟶ / State of Nature ↓	A	B	C
X	-20	-100	200
Y	200	-50	-50
Z	400	600	300

The probabilities of the states of nature are 0.3, 0.4and 0.3.
Calculate the Expected Monetary value (EMV), for the above data and select the best act. Also find the EVPI.

Answer of 15:
The appropriate decision tree is as follows:-



We find three decision points D_r D_2, D_3 in the above decision tree diagram. For analysis of the tree we start working backward.

Evaluation of Decision Points

Decision Points	Outcome	Probability	Conditional Values	Expected Values
D_3 (i) Accept A	Success Failure	0.6 0.4	20,000 - 10,000	12,000 - 4,000
				8,000
(ii) Stop				0
D_2 (i) Accept B	Success Failure	0.4 0.6	24,000 -10,000	9,600 -6,000
				3,600
(ii) Stop				0
D_3 (i) Accept A	Success Failure	0.6 0.4	20,000+3,600 - 10,000	14,160 - 4,000
				10,160
(ii) Accept B	Success Failure	0.4 0.6	24,000+8,000 -10,000	12,800 -6,000
				6,800
(iii) Do Nothing				0

From the column of expected values above, we find the best strategy is to accept A and, if it is successful then accept B.

(b) This technique is the one most adopted by analysts, both for short-term and long-term purposes. The approach of sensitivity analysis is based on the study of the impact of certain identified parameters on core performance over a period, either short-term or long-term.
In a budgetary exercise, which is essentially a short-term one, capacity utilization, price demand, etc., are taken separately as well as together to measure the impact of the variation in the parameter on profits/performance. For instance, when the break-even point (point of sales where no loss/profit occurs) is exceeded, all fixed costs are fully absorbed and contribution, namely selling price minus variable costs becomes profit. In other words, because the contribution is much higher than the profit margin, any increase in sales/ production beyond the break-even point increases the profit exponentially. Therefore, the variation in capacity utilization beyond the breakeven point needs to be fully analyzed to augment profits. In the same manner, price elasticity and demand elasticity are factors that affect marginal costs and marginal profits. We need to understand the sensitivity of both.

In the long-term, sensitivity analysis identifies/focuses on such parameters that are sensitive to the passage of time, such as assumptions relating to statutory decisions, technological obsolescence, and product life cycles. In the case of statutory decisions such as control or decontrol of product prices, the sensitivity of strategic performance to such a change becomes an important factor of risk. For example, in the sugar industry that is partially controlled and is included as an essential commodity by the Government, any change in the Government's decision relating to price control becomes a risk and needs to be fully-understood. For this, sensitivity analysis portrays the impact of variation in the amount of price control on strategic performance of the company on a calibrated basis. Besides this, the impact of technological obsolescence, which again occurs due to the passage of time during which another technology is likely to emerge, will have to be assessed as a risk. In this case, sensitivity

analysis measures the impact of risk on the basis of such obsolescence occurring in a time frame work calibrated for a particular purpose, say a major project.

Sensitivity analysis has also been extensively used to ascertain risk in terms of value relating the same to risk-adjusted expected value.

(c) Let us find the expected monetary value (EMV) of each act.

Act A = -20 x 0.3 + 200 x 0.4 +400 x 0.3 = ₹ 194
Act B = -100 x0.3 -50 x 0.4 + 600 x 0.3 = ₹ 130
Act C = 200 x 0.3 - 50 x 0.4 + 300 x 0.3 = ₹ 130

EMV of Act A is highest as seen in the table, so it should be selected.

State of nature	Prob	A	B	C	Max for state of nature	Max pay off x Prob.
X	0.3	-20	-100	200	200	200 x 0.3 = 60
Y	0.4	200	-50	-50	200	200 x 0.4 = 80
Z	0.3	400	600	300	600	600 x 0.3 = 180
Total						320

EVPI = Expected pay-off with perfect information (EPPI) - Maximum EMV = 320-194 = ₹ 126

16 (a) For the cost function $C = a_0 + b_1 - c_2x^2 + d_3x^3$, find x for which AVC & MC are minimum.

(b) For a monopolist P=10-4q and TC= 8q.

(i) If tax rate of t is imposed find the optimal p & q.

(ii) Determine the tax rate that maximizes tax revenue.

(c) Explain the Normal and Super Normal Profit.

(d) Discuss the benefits of Branding.

Answer of 16:

(a) We have $C = a_0 + b_1 - c_2x^2 + d_3x^3$ and we assume that all coefficients are positive.

Now $TVC = b_1x - C_2X^2 + d_3x^3$

$$\Rightarrow AVC = \frac{TVC}{x} = b_1 - c_2x + d_3X^2$$

Now for minimum AVC, we must have $\frac{d(AVC)}{dx} = 0 \Rightarrow -c_2 + 2d_3x = 0 \Rightarrow x = \frac{c_2}{2d_3}$

The second order condition states $\frac{d^2(AVC)}{dx} > 0 \Rightarrow 2d_3 > 0$ which is true.

Now $MC = \frac{d(c)}{dx} = b_1 - 2c_2x + 3d_3x^2$

For Minimum MC we have $\frac{d(MC)}{dx} = 0$

$$\Rightarrow -2c_2 + 6d_3x = 0 \Rightarrow x = \frac{c_2}{3d_3}$$

The second order condition states $\frac{d^2(MC)}{dx^2} > 0 \Rightarrow 6d_3 > 0$ which is true.

(b) (i) As p= 10 - 4q is the demand curve, $TR = Pq = 10q - 4q^2$.

If T be the total tax yield, T =tq.

∴ Profit (π) after the imposition of taxes is given by

$\pi = TR - TC - T = 10q - 4q^2 - 8q - tq = -4q^2 + (2-t)q$

Now profit are maximum if $\frac{d\pi}{dq} = 0 \Rightarrow -8q + (2-t) = 0$

$\Rightarrow q = \frac{2-t}{8}$

The 2nd order condition states $\frac{d^2\pi}{dq^2} < 0$ i.e. $\frac{d}{dq}(\frac{d\pi}{dq}) = -8 < 0$

Putting $q = \frac{2-t}{8}$ in the demand function we get

$p = 10 - 4(\frac{2-t}{8}) \Rightarrow p = \frac{18+t}{2}$

(ii) The tax revenue $T = t.q = t\left(\frac{2-t}{8}\right) = \frac{2t-t^2}{8}$

Now t is maximum if $\frac{dT}{dt} = 0$ and $\frac{d^2\pi}{dt^2} < 2$

$\frac{dT}{dt} = 0 \Rightarrow \frac{2-2t}{8} = 0 \Rightarrow t = 1$ and $\frac{d^2t}{dt^2} = \frac{-2}{8} < 0$

At t= 1 , the tax revenue is maximum and maximum value of

$T = \frac{2\times1-1\times1}{8} = \frac{1}{8}$

(c) Normal Profit

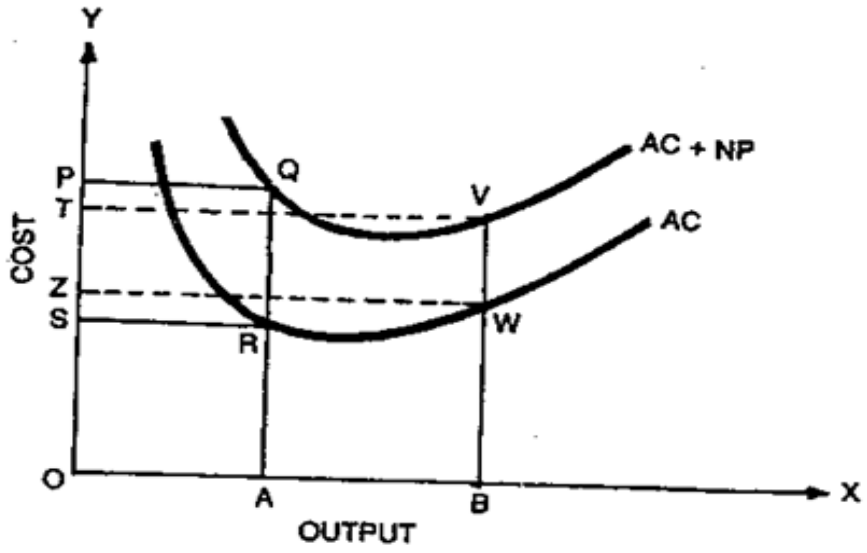
It refers to that amount of earnings which is just sufficient to induce the firm to stay in the industry. Normal profit is, thus, the minimum reasonable level of profit which the entrepreneur must get in the long run, so that he is induced to continue the employment of his resources in its present form.

Normal profit is the opportunity cost of entrepreneurship. It is equivalent to the transfer earnings of the entrepreneur. That means, if the entrepreneur fails to earn the normal rate of profit in the long run, he will close down the operation of his firm and quit the industry in order to shift his resources elsewhere.

Normal profit is considered as the least possible reward which in the long run must be earned by the entrepreneur, as compensation for his organizational services as well as for bearing the insurable business risks.

Normal profit is always regarded as a part of factor costs. Since entrepreneurial service is a factor of production, the price paid for it is the normal profit and it is to be incorporated while calculating the total cost. Of course, normal profit is the implicit money cost. Thus, in the economic sense, when the total cost (Q) is measured, it also covers the normal profit of the firm. As such, when *R* = C, ordinarily it will be inferred that there is no profit. In the economic sense, though we may say, there is no pure business profit, but there is normal profit, which is already embedded in the total cost.

It must be remembered that the entrepreneur desires a fixed amount as normal profit, which is independent of the output. So, normal profit as a factor cost is a fixed implicit cost element. Evidently, when output expands, total normal profit like *TFC* gets spread over the range of output. This has a bearing on the shape of the average cost curve *(AC),* as shown in following Figure.



Following Stonier and Hague (1966), in above Figure, we have drawn two *AC* curves, one excluding normal profit-cost element *(AC)* and another by including it *(AC + NP)*. It may be observed that as we move from left to right, the vertical distance between *AC* and *AC + NP* curves tend to become narrow in a steady manner. This implies that as output increases, normal profit per unit of output diminishes.

However, the total normal profit at all levels of output remains the same. Geometrically, thus, when output is *OA,* the average normal profit is *QR*. When output rises to *OB,* the average normal profit diminishes to *VW*. Total normal profit is *PQRS* in the former case and *TVWZ* in the latter case. However, *PQRS = TVWZ*.

Normal profit is measured by the difference between *AC + NP* and *AC* curves.

In economic theory, thus, whenever the average cost curve is drawn, the normal profit as the factor cost element of a fixed nature is always included; hence, *ATC* curve means *AC + NP* curve.

A theoretical importance of the concept of normal profit is for determining the industry's equilibrium. When only normal profit is earned by the existing firms there will be no new entry in the competitive market or the industry.

Supernormal Profit

Profits in excess of normal profit are considered as supernormal. Since normal profit is included in the cost of production, supernormal profit is obtained when total revenue exceeds total costs *(i.e., TR > TC)*. It is also called pure business profit or "excess profit."

Supernormal profit depends on the demand conditions in the business, which is uncertain and unpredictable. Thus, supernormal profit is the reward for bearing uncertainties and unpredictable risks of business. Sometimes, in a competitive market, supernormal profit is also earned due to extraordinary efficiency on the part of the entrepreneur.

When the existing firms earn supernormal profit, new entries will be attracted to the industry, so the equilibrium of the industry is threatened.

Incidentally, when *TR > TC,* such that only a part of normal profit is earned by the firm, it is called subnormal profit. Subnormal profit is the profit below the normal profit earned when total revenue covers up explicit costs fully and a part of implicit cost of entrepreneurial services.

(d) Benefits of Branding:

Provides benefits to buyers and sellers

To Buyer:

• Help buyers identify the product that they like/dislike.

• Identify marketer
•Helps reduce the time needed for purchase.
•Helps buyers evaluate quality of products especially if unable to judge a products characteristics.
• Helps reduce buyers perceived risk of purchase.
• Buyer may derive a psychological reward from owning the brand, i.e. Rolex or Mercedes.

To Seller:

• Differentiate product offering from competitors
• Helps segment market by creating tailored images, i.e. **Contact lenses**
• Brand identifies the companies' products making repeat purchases easier for customers.
• Reduce price comparisons
• Brand helps firm introduce a new product that carries the name of one or more of its existing products half as much as using a new brand, lower co. designs, advertising and promotional costs.

17 (a) Explain the advantages and disadvantages Return on Capital Employed (ROCE).

(b) State the main types of information which will be required by a Manager to implement the Balanced Score Card approach to performance Measurement.

(c) "One of the major causes of company's decline is low productivity. Failure to meet targeted productivity can result to high costs per unit, hence higher prices, making your good, services, or commodities not competitive enough on the market." – Justify the statements with a view of twelve productivity improvement techniques.

Answer of 17:

(a) The advantages and disadvantages of the Return on Capital Employed:

Advantages	Disadvantages
Easy to calculate.	Research shows a correlation between ROCE and Shareholder value.
Figures are readily available.	Care must be taken to ensure that like is compared with like, when comparing with different companies- e.g. inclusion of intangibles in capital employed.
Measures how well a business is utilizing the funds invested in it.	Can be distorted by accounting policies.
Often used by external analysts / investors.	ROCE can be improved by cutting back investment- this may not be in the company's long term best interest.

(b) A well designed Balanced Score Card combines financial measures of past performance with measures of the Firm's drivers of future performance. The specific objectives and measures of a Firm's BSC are derived from the Firm's vision and strategy. Generally, the BSC has the following perspectives from which a Company's activity can be evaluated.

(i) **Customer perspective i.e. how customers see us?** In order to translate effective internal processes into organizational success, customers/ clients must be happy with the service they receive. The Customer perspective considers the business through the eyes of the customers, measuring and reflecting upon customers' satisfaction.

(ii) **Internal perspective i.e., in what processes must the Firm excel?** The Internal perspective focuses attention on the performance of the key internal processes, which drive the business. The nature of the processes is dependent on the nature of the organization.

(iii) **Innovation and learning perspective i.e., Can we continue to improve and create value?** The Learning and Growth perspective is a measure of potential future performance – it directs attention to the basis of all future success – the organization's people and infrastructure. Adequate investment in these areas is critical to all long –term success.

(iv) **Financial perspective i.e., how we look to our shareholders?** The Financial perspective measures the results that the organization delivers to its stakeholders.

(c) Many businesses try very hard to remain competitive in the market. Therefore, it is important for businesses to implement strategies to make improvements in productivity levels.

Twelve productivity improvement techniques are explained as follows:

1. **Value Engineering (VE)** : Value Engineering (VE) is the process of improving the value of a product at every stage of the product life cycle. At the development stage, VE improves the value of a product by reducing the cost without reducing quality. At the maturity stage, VE reduces the cost by replacing the costly components (parts) by cheaper components. VE also tries to improve the value and quality of the product. Value is the satisfaction which the consumer gets by using the product. VE tries to give maximum value for a lowest price.

2. **Quality Circles (QC)** : The concept of Quality Circles (QC) was introduced in **1960** in **Japan**. QC is a small group of employees who meet regularly to identify, analyze, and solve problems in their department. The QC members advise the management to implement new methods to solve work-related problems. QC increases the productivity.

3. **Financial and Non-Financial Incentives:** The organization must motivate the employees by providing financial and non-financial incentives. The financial incentives include better wages and salaries, bonus, etc. The non-financial incentives include better working conditions, welfare facilities, worker's participation in management, etc.

4. **Operations Research (OR):** Operations Research (OR) uses mathematical and scientific methods to solve management problems, including problems of productivity. QR technique uses a scientific method to study the alternative courses of actions and to select the best alternative. OR uses techniques such as linear programming, game theory, etc., to make the right decision. Thus, QR helps to improve productivity.

5. **Training:** Training is a process of increasing the knowledge and skills of the employees. Training is a must, for new employees and experienced employees. Training increases the efficiency of the employee. Thus, training results in high productivity.

6. **Job Enlargement:** Job Enlargement is a horizontal expansion of a job. It is done to make jobs more interesting and satisfying. It involves increasing the variety of

duties. For e.g. a typist may be given the job of accounts writing in addition to the work. This technique is used for lower level jobs.

7. **Job Enrichment:** Job Enrichment is a vertical expansion of a job. It makes routine jobs more meaningful and satisfying. It involves providing more challenging tasks, and responsibilities. For e.g. a manager who prepares performance reports are asked to make plans for his department. Job Enrichment technique is used for higher-level jobs.

8. **Inventory Control:** There must be a proper level of inventory. Overstocking and under stocking of inventories must be avoided. Overstocking of inventories will result in blocking of funds and there are chances of spoilage or misuse of materials. Under stocking of inventories will result in shortages. This will block the smooth flow of production, and so the delivery schedules will be affected.

9. **Materials' Management:** Materials' management deals with optimum utilization of materials in the manufacturing process. It involves scientific purchasing, systematic store keeping, proper inventory control, etc. The main objective of materials' management is to purchase the right quantity and quality materials, at the right prices, at the right time, to maintain favourable relations with suppliers, to reduce the cost of production, etc

10. **Quality Control:** The main objective of quality control is to produce good quality goods at reasonable prices, to reduce wastages, to locate causes of quality deviation and to correct such deviations, to make the employees quality conscious, etc.
11. **Job Evaluation:** Job Evaluation is a process of fixing the value of each job in the organization. It is done to fix the wage rate for each job. A proper job evaluation increases the moral of the employees. This increases the productivity.

12. **Human factor engineering:** Human factor engineering refers to the man-machine relationship. It is designed to match the technology to a human requirement. The term **Ergonomics** has originated from the Greek word 'ergos' meaning 'Work' and 'nomikos' meaning 'Law'. So, it means 'Law of Work'. It tells us how to fit a job to a man's psychological and physiological characteristics to increase human efficiency and well-being.

18 (a) Explain the 'Contractual Terms' in the context of interaction of Transfer pricing and Taxation – Post evaluation of strategic business arrangement.
(b) What is Process Analysis? Explain the objectives of Process Analysis.
(c) Discuss the components of Performance management.

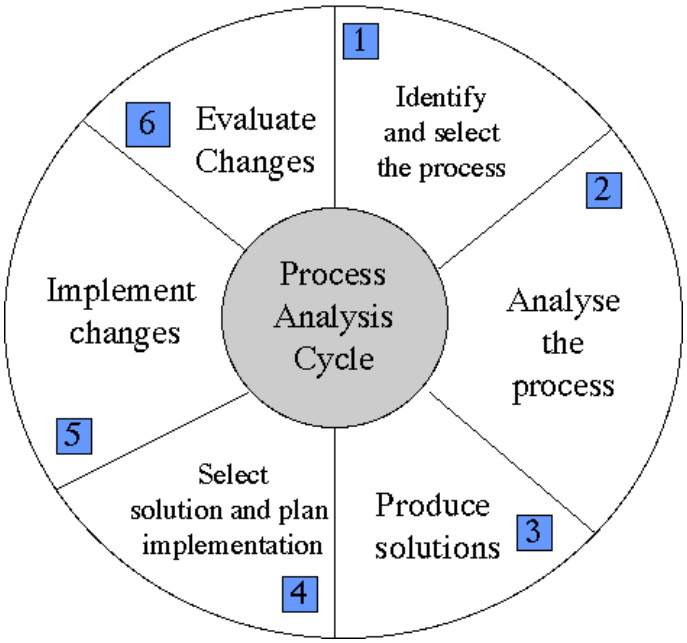
Answer of 18:

(a) Contractual Terms:
Contractual arrangements are the starting point for determining which party to a transaction bears the risk associated with it. Accordingly, it would be a good practice for associated enterprises to document in writing their decisions to allocate or transfer significant risks before the transactions with respect to which the risks will be borne or transferred occur, and to document the evaluation of the consequences on profit potential of significant risk reallocations. Where no written terms exist, the contractual relationships of the parties must be deduced from their conduct and the economic principles that generally govern relationships between independent enterprises.
A tax administration is entitled to challenge the purported contractual allocation of risk between associated enterprises if it is not consistent with the economic substance of the transaction. Therefore, in examining the risk allocation between associated

enterprises and its transfer pricing consequences, it is important to review not only the contractual terms but also the following additional questions:

- Whether the conduct of the associated enterprises conforms to the contractual allocation of risks,
- Whether the allocation of risks in the controlled transaction is arm's length, and
- What the consequences of the risk allocation are.

(b) A process can be defined as "a logical series of related transactions that converts input to results or output". The process we are considering is a "business process," which can be defined as "a chain of logical connected, repetitive activities that utilizes the organization's resources to refine an object for the purpose of achieving specified and measurable results or products for internal or external customers."



Objectives of Process Analysis

For many organizations their goals and objectives are fulfilled once they complete the review process and the Process Capture project stops at that point. For others it is important to move beyond the basic process documents and analyze the data collected and documents.

In working with many organizations over 20 years, a good strategy with analysis is to look at the process through three angles to analyze and identify areas for change.

These are **Understanding**, **Quality** and **Efficiency**. By systematically reviewing the process through each of these steps, a much improved and comprehensive analysis will result.

The objectives of analyzing the process include:
(i) Identify what makes maps difficult to understand and use
(ii) Evaluate completeness
(iii) Isolate bottlenecks
(iv) Find redundancies
(v) Examine resources allocation
(vi) Measure process times

(c) Components of Performance Management:

1. **Performance Planning:** Performance planning is the first crucial component of any performance management process which forms the basis of performance appraisals. Performance planning is jointly done by the appraise and also the review in the beginning of a performance session. During this period, the employees decide upon the targets and the key performance areas which can be performed over a year within the performance budget. Which is finalized after a mutual agreement between the reporting officer and the employee?

2. **Performance Appraisal and Reviewing:** The appraisals are normally performed twice in a year in an organization in the form of mid reviews and annual reviews which is held in the end of the financial year. In this process, the appraise first offers the self filled up ratings in the self appraisal form and also describes his/her achievements over a period of time in quantifiable terms. After the self appraisal, the final ratings are provided by the appraiser for the quantifiable and measurable achievements of the employee being appraised. The entire process of review seeks an active participation of both the employee and the appraiser for analyzing the causes of loopholes in the performance and how it can be overcome. This has been discussed in the performance feedback section.

3. **Feedback on the Performance followed by personal counseling and performance facilitation:** Feedback and counseling is given a lot of importance in the performance management process. This is the stage in which the employee acquires awareness from the appraiser about the areas of improvements and also information on whether the employee is contributing the expected levels of performance or not. The employee receives an open and a very transparent feedback and along with this the training and development needs of the employee is also identified. The appraiser adopts all the possible steps to ensure that the employee meets the expected outcomes for an organization through effective personal counseling and guidance, mentoring and representing the employee in training programmers which develop the competencies and improve the overall productivity.

4. **Rewarding good performance:** This is a very vital component as it will determine the work motivation of an employee. During this stage, an employee is publicly recognized for good performance and is rewarded. This stage is very sensitive for an employee as this may have a direct influence on the self esteem and achievement orientation. Any contributions duly recognized by an organization helps an employee in coping up with the failures successfully and satisfies the need for affection.

5. **Performance Improvement Plans:** In this stage, fresh set of goals are established for an employee and new deadline is provided for accomplishing those objectives. The employee is clearly communicated about the areas in which the employee is expected to improve and a stipulated deadline is also assigned within which the employee must show this improvement. This plan is jointly developed by the appraise and the appraiser and is mutually approved.

6. **Potential Appraisal:** Potential appraisal forms a basis for both lateral and vertical movement of employees. By implementing competency mapping and various assessment techniques, potential appraisal is performed. Potential appraisal provides crucial inputs for succession planning and job rotation.

19 BPR of Visakhapatnam Steel Plant – A Case study

Visakhapatnam Steel Plant (VSP) is one of the most modern steel plants in the country. In the year 1979, to meet the growing domestic needs of steel, Government of India signed an agreement with erstwhile USSR for cooperation in setting up 3.6 million tons integrated steel plant at Visakhapatnam. The project was estimated to cost ₹ 3,897.28 crores based on prices of fourth quarter of 1981 but on completion of construction and commissioning of whole plant in 1992, the cost was escalated to around ₹ 8,500 crores. The plant has a capacity of producing 3 million tons of liquid steel and 2.656 million tons of saleable steel. The main products of VSP are angles, billets, channels, beams, squares, flats, rounds rebars, wire rods. The major units in VSP are Coke Ovens, Sinter Plant, Blast Furnace, Steel Melt Shop (SMS), Light and Medium Merchant Mill (LMMM), Wire Rod Mill (WRM), Medium & Structural Mill (MMSM).

The vision of VSP is to become a 10 million tons world class integrated steel plant by 2019-20. Its mission is to be a continuously growing company through technological up gradation, operational efficiency and expansion, producing steel at international standards of cost and quality ensuring optimal return on investment to stakeholders and meeting expectations of the customers. The core values of VSP are commitment, customer satisfaction, continuous improvement, concern for environment.

Constraints faced by VSP

Today, VSP is moving forward with an aura of confidence with pride to enable the company to reach new heights in organizational excellence. But in the earlier days, the plant, inspite of securing a reduction in the interest burden to a large extent through capital restructuring in 1993, could not attain envisaged capacity levels and financial viability. While price of steel was stagnant, high capital cost and large borrowings resulted in huge cost overruns and high capital-related charges. The input costs were high and raw materials prices had gone up. The recession in the steel industry was another cause for depression. It has been exposed to global competition by liberal imports. Apart from all this, in the year 1998-99, Coke Oven Batteries came to a halt for the production of pig iron and finished steel as well as forcing a lengthy repair schedule. Also, sluggish economy both in domestic and international market led to reduction in sales turnover. Economic crisis in South-East Asian markets led to a large scale dumping of steel from their countries which

adversely affected the export performance. The production factor of finished steel had declined in 1998-99 as compared to previous years.

Due to all these constraints faced by VSP, it was written off as the 'sick child of the industry'. The plant's accumulated losses crossed 50% of its capital base. VSP had to report the fact to BIFR (Board for Industrial and Financial Reconstruction) as the accumulated losses were necessitating reportability for potential sickness. In the process, the situation engendered the loose talk of privatization of the plant. VSP was directed to formulate turnaround strategy for long-term financial viability of the plant. VSP had submitted a capital restructuring proposal during July 1993 to Government, which had not been approved. Again, a second capital restructuring proposal was undertaken in 1998, converting government loans into redeemable preference share capital.

Turnaround Strategies Implemented at VSP

It was time that VSP realized the changed economic and industrial scenario and also that nothing could be expected of cash-strapped Union Government. It needed to pick up the gauntlet to face the rough weather by identifying areas needing improvement and concentrating on them to lead to progressive results. During 1998-99, the company facilitated the issue of 7% non-cumulative preference shares to Government of India that resulted in the increase of authorized share capital of the company from ₹6,500 crores to ₹ 8,000 crores. The interest rates on long-term were reduced. Introducing the corporate cash management scheme through Canara Bank, the company got daily sales collection of major branches on the same day at Head quarters. The company prepaid entire outstanding loan to UTI and part prepayments of term loans from banks through the wealth made out of internal generation through various measures.

The major step taken by VSP is utilizing the element of aggressive treasury management. The company had taken the step of rescheduling of high cost loans with low cost loans by prepaying loans with higher interest and obtaining softer interest loans from banks. VSP has substituted high cost working capital demand loans with softer interest product like commercial paper. Also VSP secured cheaper lines of credit for import of raw materials.

During 2001-02, savings were achieved by change in mode of shipment of limestone, reduction in price of major purchases achieved by way of negotiation and cash flow was reduced on account of special additional duty. VSP has strived to achieve the best from its internal resources and attain funds through internal generation. The plant has taken innovative steps to operate consistently beyond rated capacities in all the production units. Efficient operation management coupled with optimum waste utilization and improved techno-economic parameters along with cost reduction measures have been the major contributing factors that led to VSP's turnaround.

With regard to techno-economic front, during the period from 1998-99 to 2002-03, the plant has made a significant improvement in the specific energy consumption, specific refractory consumption, average converter life, rolling rate, total coke rate and fuel consumption. Thrust was given for recycling of metallurgical waste and smaller fractions of coke in solid waste and the materials generated in the plant were collected, segregated, used or sold. Initiatives taken to recycle the solid waste and utilizing them led to a saving of raw material consumption.

Another major strategy of VSP that resulted in the turnaround of the company is the cost reduction measures taken in the plant production. Technological improvement schemes, usage of recycled solid wastes, usage of certain inputs in partial replacement with costlier ones, power generation through waste heat, internal recovery of copper for making value-added steel were major cost reduction measures taken. Initiatives were taken to consume freshly generated and

accumulated metallurgical wastes. The company had laid emphasis on total involvement by workers participation in management through suggestion schemes, which played a major role in rapid growth of techno-economic parameter and labour productivity.

Required:
(a) Mention the principles of Business Process Re-engineering?

(b)State the reasons for which VSP faced challenges for implementing the Business Process Re- engineering?

(c) What strategies are taken by the VSP for facing the challenge?

Answer of 19:

(a) Principles:

Hammer and Champy felt that the design of workflow in most large corporations was based on assumptions about technology, people, and organizational goals that were no longer valid. They suggested seven principles of reengineering to streamline the work process and thereby achieve significant levels of improvement in quality, time management, and cost:

(i) Organize around outcomes, not tasks.

(ii) Identify all the processes in an organization and prioritize them in order of redesign urgency.

(iii) Integrate information processing work into the real work that produces the information.

(iv) Treat geographically dispersed resources as though they were centralized.

(v) Link parallel activities in the workflow instead of just integrating their results.

(vi) Put the decision point where the work is performed, and build control into the process.

(vii) Capture information once and at the source.

By the mid-1990's, BPR gained the reputation of being a nice way of saying **"downsizing."** According to Hammer, lack of sustained management commitment and leadership, unrealistic scope and expectations and resistance to change prompted management to abandon the concept of BPR and embrace the next new methodology, enterprise resource planning (**ERP**).

Business Process Re-engineering is also known as Business Process Redesign, Business Transformation, or Business Process Change Management.

(b) Today, VSP is moving forward with an aura of confidence with pride to enable the company to reach new heights in organizational excellence. But in the earlier days, the plant, inspite of securing a reduction in the interest burden to a large extent through capital restructuring in 1993, could not attain envisaged capacity levels and financial viability. While price of steel was stagnant, high capital cost and large borrowings resulted in huge cost overruns and high capital-related charges. The input costs were high and raw materials prices had gone up. The recession in the steel industry was another cause for depression. It has been exposed to global competition by liberal imports. Apart from all this, in the year 1998-99, Coke Oven Batteries came to a halt for the production of pig iron and finished steel as well as

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(c) It was time that VSP realized the changed economic and industrial scenario and also that nothing could be expected of cash-strapped Union Government. It needed to pick up the gauntlet to face the rough weather by identifying areas needing improvement and concentrating on them to lead to progressive results. During 1998-99, the company facilitated the issue of 7% non-cumulative preference shares to Government of India that resulted in the increase of authorized share capital of the company from ₹6,500 crores to ₹ 8,000 crores. The interest rates on long-term were reduced. Introducing the corporate cash management scheme through Canara Bank, the company got daily sales collection of major branches on the same day at Head quarters. The company prepaid entire outstanding loan to UTI and part prepayments of term loans from banks through the wealth made out of internal generation through various measures.

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20. FOOD CORPORATION OF INDIA: SUPPLY CHAIN MANAGEMENT

Food Corporation of India (FCI) was established under the Food Corporation of India Act 1964 for the purpose of trading in food grains and other foodstuffs. The Act extended to the whole of India. The Corporation acts as a body corporate. The general superintendence, direction and management of the affairs and business of the Corporation vests in a board of directors, which exercises all such powers and does all such acts and things as may be exercised or performed by the Corporation under the FCI Act.

FCI performs the major functions of procurement, storage preservation, movement, transportation, distribution and sale of food grains and meets the requirements of Public Distribution System (PDS) in the country. In other words, it handles or manages the entire supply chain in food grains distribution in India. It acts as a nodal agency of the central government based on ethical business principles having regard to the interest of the producers (farmers) and consumers.

Supply chain management of food grains by FCI is actually a joint responsibility of the Central Government, the state governments and the union territories involved in the actual implementation of PDS. Functions of the centre are to procure, store and transport. The implementation and administration of PDS is the responsibility of the state government and the UT administration. They lift these commodities from central godowns mills and distribute them to consumers through the massive network of fair price shops. Monitoring, inspection and enforcement of legal provisions is also done by the state government and the UT administration.

The network of fair price shops (FPS) has been expanding over the years, adding to the supply chain. During the last decade, the number of fair price shops had increased from 3.61 lakh (1990) to 4.59 lakh (2004) as indicated in the following:

Increase in No. of Fair Price Shops

Year	No. of FPS (in lakhs)
1985	3.19
1987	3.38
1990	3.61
2004	4.59

An efficient supply chain management requires the establishment of a close link between production, procurement, transportation, storage and distribution of selected commodities. Infrastructure needs to be strengthened, particularly in the backward, remote and inaccessible areas. The system also needs to be much improved to make it cost-effective. There is need for buffer stock in such a system. But, buffer stock can be reduced by timely procurement, transportation and storage.

This would reduce the carrying costs of the goods meant for distribution. The costs can also be reduced by increasing efficiency in the distribution network.

Leakages during the movement of food grains, etc., need to be plugged. Proper and timely checks of the fair price shops, godown, etc., can also lower the cost of PDS operations and the total supply chain management. FCI has to ultimately ensure a cost-effective supply chain and, for this, appropriate modalities have to be worked out.

Required:

(a) Explain the objectives of Supply Chain Management?

(b) Describe the Importance of Supply Chain Management?

(c) Discuss the advantages and disadvantages after implementing the supply chain management by FCI?

Answer of 20 :

(a) Objective of Supply Chain Management:

i. Supply chain Management takes into consideration every facility that has an impact on cost and plays a role in making the product conform to customer requirements: from supplier and manufacturing facilities through warehouses and distribution centers to retailers and stores.

ii. The supply chain management is to be efficient and cost –effective across the entire system; total system wide costs from transportation and distribution to inventories of raw materials, work – in-process and finished goods are to be minimized.

iii. Finally, supply chain management revolves around efficient integration of suppliers, manufacturers, warehouses and stores; it encompasses the firm's activities at many levels, from the strategic level through the tactical to the operational level.

(b) In the ancient Greek fable about the tortoise and the hare, the speedy and overconfident rabbit fell asleep on the job, while the "slow and steady" turtle won the race. That may have been true in Aesop's time, but in today's demanding business environment, "slow and steady" won't get you out of the starting gate, let alone win any races. Managers these days recognize that getting products to customers faster than the competition will improve a company's competitive position. To remain competitive, companies must seek new solutions to important Supply Chain Management issues such as modal analysis, supply chain management, load planning, route planning and distribution network design. Companies must face corporate challenges that impact Supply Chain Management such as reengineering globalization and outsourcing.

Why is it so important for companies to get products to their customers quickly? Faster product availability is key to increasing sales, says R. Michael Donovan of Natick, Mass., a management consultant specializing in manufacturing and information systems. "There's a substantial profit advantage for the extra time that you are in the market and your competitor is not," he says. "If you can be there first, you are likely to get more orders and more market share." The ability to deliver a product faster also can make or break a sale. "If two alternatives [products] appear to be equal and one is immediately available and the other will be available in a week, which would you choose? Clearly, **"Supply Chain Management has an important role to play in moving goods more quickly to their destination."**

(c) This would reduce the carrying costs of the goods meant for distribution. The costs can also be reduced by increasing efficiency in the distribution network.

Leakages during the movement of food grains, etc., need to be plugged. Proper and timely checks of the fair price shops, godown, etc., can also lower the cost of PDS operations and the total supply chain management. FCI has to ultimately ensure a cost-effective supply chain and, for this, appropriate modalities have to be worked out.

Section - B

21.(a) Describe the Technical and Operational factors of E-commerce.

(b) State the following terms:

(i) Data Availability, (ii) Data Envelopment Analysis, (iii) Data Warehouses.

(c) Describe the Recurrent Artificial Neural Networks.

Answer of 21:

(a) Technical and Operational Factors of E-commerce:

(i) Protocol (Standards) Making Process

A well-established telecommunications and Internet infrastructure provides many of the necessary building blocks for development of a successful and vibrant e-commerce marketplace.

(ii) Delivery Infrastructure

Successful e-commerce requires a reliable system to deliver goods to the business or private customer.

(iii) Availability of Payment Mechanisms

Secure forms of payment in e-commerce transactions include credit cards, checks, debit cards, wire transfer and cash on delivery.

(iv) General Business Laws

The application of general business laws to the Internet will serve to promote consumer protection by insuring the average consumer that the Internet is not a place where the consumer is a helpless victim.

(v) Public Attitude to E-commerce

The public attitude toward using e-commerce in daily life is a significant factor in the success of ecommerce.

(vi) Business Attitude to E-commerce

The willingness of companies to move away from traditional ways of doing business and develop methods and models that include e-commerce is essential.

(b) (i) Data Availability

Data availability is a term used by some computer storage manufacturers and storage service providers (SSPs) to describe products and services that ensure that data continues to be available at a required level of performance in situations ranging from normal through "disastrous." In general, data availability is achieved through redundancy involving where the data is stored and how it can be reached. Some vendors describe the need to have a data center and a storage-centric rather than a server-centric philosophy and environment.

In large enterprise computer systems, computers typically access data over high-speed optical fiber connection to storage devices. Among the best-known systems for access are ESCON and Fibre Channel. Storage devices often are controlled as a redundant array of independent disks (RAID). Flexibility for adding and reconfiguring a storage system as well as automatically switching to a backup or failover environment is provided by a programmable or manually-controlled switch generally known as a director.

Two increasingly popular approaches to providing data availability are the storage area network (SAN) and network-attached storage (NAS). Data availability can be measured in terms of how often the data is available (one vendor promises 99.999 per cent availability) and how much data can flow at a time (the same vendor promises 3200 megabytes per second).

(ii) Data Envelopment Analysis (DEA)

DEA is today one of the most successful methods of operational research with a wide range of applications and an extensive bibliography is available (Giokas & Pentzaropoulos 2000). For instance, Emrouznejad, Parker, and Tavares (2008), in their extensive searches, have identified more than 4000 research articles published in journals or book chapters. They also enlightened that the evolution of DEA as a worldwide accepted operations research / management science tool and has been tracked in terms of the increases of publications and applications. The results of DEA are relative performance measures. With respect to the efficiency frontier, which is built by the efficient DMUs, the amount of improvement required for the

inefficient DMUs are determined. The flexibility of DEA has been demonstrated successfully in numerous performance appraisals in real environments.

- Assess the performance of police forces in England and Wales (Thanassoulis 1995)
- Performance appraisal of engineering design personnel (Paradi, et al. 2002)
- Performance appraisal of primary care physicians (Wagner, Shimshak & Novak 2003)

Data envelopment analysis (DEA) is a linear programming methodology to measure the efficiency of multiple decision-making units (DMUs) when the production process presents a structure of multiple inputs and outputs.

"DEA has been used for both production and cost data. Utilizing the selected variables, such as unit cost and output, DEA software searches for the points with the lowest unit cost for any given output, connecting those points to form the efficiency frontier. Any company not on the frontier is considered inefficient. A numerical coefficient is given to each firm, defining its relative efficiency. Different variables that could be used to establish the efficiency frontier are: number of employees, service quality, environmental safety, and fuel consumption. An early survey of studies of electricity distribution companies identified more than thirty DEA analyses—indicating widespread application of this technique to that network industry. (Jamasb, T. J., Pollitt, M. G. 2001). A number of studies using this technique have been published for water utilities. The main advantage to this method is its ability to accommodate a multiplicity of inputs and outputs. It is also useful because it takes into consideration returns to scale in calculating efficiency, allowing for the concept of increasing or decreasing efficiency based on size and output levels. A drawback of this technique is that model specification and inclusion/exclusion of variables can affect the results." (Berg 2010)

Some of the advantages of DEA are:

- No need to explicitly specify a mathematical form for the production function.
- Proven to be useful in uncovering relationships that remain hidden for other methodologies.
- Capable of handling multiple inputs and outputs.
- Capable of being used with any input-output measurement.
- The sources of inefficiency can be analyzed and quantified for every evaluated unit.

Some of the disadvantages of DEA are:

- Results are sensitive to the selection of inputs and outputs (Berg 2010).
- You cannot test for the best specification (Berg 2010).
- The number of efficient firms on the frontier tends to increase with the number of inputs and output variables (Berg 2010).

DEA measures efficiency by estimating an empirical production function, which represents the highest values of outputs that could be generated by relevant inputs, as obtained from observed and input output vectors for the analyzed Decision Making Units (DMU). The efficiency of a DMU is then measured by the distance from the point representing its input and output values to the corresponding reference point on the production function (Mohamed & Luc 2008).

(iii) Data Warehouses:

A primary goal of a data warehouse is to increase the "intelligence" of a decision process and the knowledge of the people involved in this process. For example, the ability of product marketing executives to look at multiple dimensions of a product's sales performance by region, by type of sales, by customer demographics may

enable better promotional efforts, increased production, or new decisions in product inventory and distribution. It should be noted that average companies work with averages. The superstars differentiate themselves by paying attention to the details. They may need to slice and dice the data in different ways to obtain a deeper understanding of their organization and to make possible improvements. To undertake these processes, users have to know what data exists, where it is located, and how to access it.

A data warehouse means different things to different people. Some definitions are limited to data; others refer to people, processes, software, tools, and data. One of the global definitions is that the data warehouse is a collection of integrated, subject-oriented databases designed to support the decision-support functions (DSF), where each unit of data is relevant to some moment in time.

Two aspects of a data warehouse are most important for a better understanding of its design process: the first is the specific types (classification) of data stored in a data warehouse, and the second is the set of transformations used to prepare the data in the final form such that it is useful for decision making. A data warehouse includes the following categories of data, where the classification is accommodated to the time-dependent data sources:

(i) Old detail data
(ii) Current (new) detail data
(iii) Lightly summarized data
(iv) Highly summarized data
(v) Metadata (the data directory or guide).

To prepare these five types of elementary or derived data in a data warehouse, the fundamental types of data transformation are standardized. There are four main types of transformations, and each has its own characteristics:

(i) Simple transformations - These transformations are the building blocks of all other more complex transformations. This category includes manipulation of data that is focused on one field at a time, without taking into account its values in related fields. Examples include changing the data type of a field or replacing an encoded field value with a decoded value.

(ii) Cleansing and scrubbing - These transformations ensure consistent formatting and usage of a field, or of related groups of fields. This can include a proper formatting of address information, for example. This class of transformations also includes checks for valid values in a particular field, usually checking the range or choosing from an enumerated list.

(iii) Integration - This is a process of taking operational data from one or more sources and mapping it, field by field, onto a new data structure in the data warehouse. The common identifier problem is one of the most difficult integration issues in building a data warehouse. Essentially, this situation occurs when there are multiple system sources for the same entities and there is no clear way to identify those entities as the same. This is a challenging problem, and in many cases it cannot be solved in an automated fashion. It frequently requires sophisticated algorithms to pair up probable matches. Another complex data-integration scenario occurs when there are multiple sources for the same data element. In reality, it is common that some of these values are contradictory, and resolving a conflict is not a straightforward process. Just as difficult as having conflicting values is having no value for a data element in a warehouse. All these problems and corresponding automatic or semiautomatic solutions are always domain-dependent.

(iv) Aggregation and summarization - These are methods of condensing instances of data found in the operational environment into fewer instances in the warehouse environment. Although the terms aggregation and summarization are often used interchangeably in the literature, we believe that they do have slightly different meanings in the data-warehouse context. Summarization is a simple addition of

values along one or more data dimensions; e.g., adding up daily sales to produce monthly sales. Aggregation refers to the addition of different business elements into a common total; it is highly domain-dependent. For example, aggregation is adding daily product sales and monthly consulting sales to get the combined, monthly total.

These transformations are the main reason why we prefer a warehouse as a source of data for a data-mining process. If the data warehouse is available, the preprocessing phase in data mining is significantly reduced, sometimes even eliminated. Do not forget that this preparation of data is the most time-consuming phase.

Although the implementation of a data warehouse is a complex task, described in many texts in great detail, in this text we are giving only the basic characteristics. A three-stage data-warehousing development process is summarized through the following basic steps:

(i) **Modeling** - In simple terms, to take the time to understand business processes, the information requirements of these processes, and the decisions that are currently made within processes.

(ii) **Building** - To establish requirements for tools that suit the types of decision support necessary for the targeted business process; to create a data model that helps further define information requirements; to decompose problems into data specifications and the actual data store, which will, in its final form, represent either a data mart or a more comprehensive data warehouse.

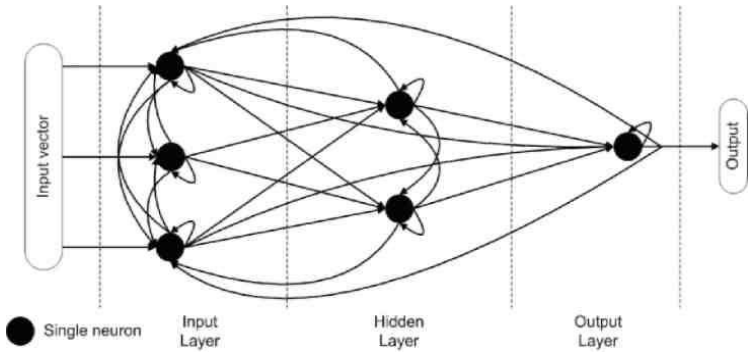
(iii) **Deploying** - To implement, relatively early in the overall process, the nature of the data to be warehoused and the various business intelligence tools to be employed; to begin by training users. The deploy stage explicitly contains a time during which users explore both the repository (to understand data that are and should be available) and early versions of the actual data warehouse. This can lead to an evolution of the data warehouse, which involves adding more data, extending historical periods, or returning to the build stage to expand the scope of the data warehouse through a data model.

Data mining represents one of the major applications for data warehousing, since the sole function of a data warehouse is to provide information to end users for decision support. Unlike other query tools and application systems, the data-mining process provides an end-user with the capacity to extract hidden, nontrivial information. Such information, although more difficult to extract, can provide bigger business and scientific advantages and yield higher returns on "data ware-housing and data mining" investments.

(c) Recurrent Artificial Neural Networks:

Artificial neural network with the recurrent topology is called Recurrent artificial neural network. It is similar to feed-forward neural network with no limitations regarding back-loops. In these cases information is no longer transmitted only in one direction but it is also transmitted backwards. This creates an internal state of the network which allows it to exhibit dynamic temporal behaviour. Recurrent artificial neural networks can use their internal memory to process any sequence of inputs. The following figure shows small Fully Recurrent artificial neural network and complexity of its artificial neuron interconnections. The most basic topology of recurrent artificial neural network is fully recurrent artificial network where every basic building block (artificial neuron) is directly connected to every other basic building block in all direction. Other recurrent artificial neural networks such as

Hopfield, Elman, Jordan, bi-directional and other networks are just special cases of recurrent artificial neural networks.



22 (a) State the key roles of for its successful implementation in Six sigma.
(b) Describe the methods of Statistical Process Control (SPC).
(c)"The MI is based on the concept of the Production function. This is a function of maximum possible production, with respect to a set of inputs pertaining to capital and labour" – Discuss it.

Answer of 22:

(a) Six Sigma identifies several key roles for its successful implementation.

- Executive Leadership includes the CEO and other members of top management who are responsible for setting up a vision for Six Sigma implementation. They also empower the other role holders with the freedom and resources to explore new ideas for breakthrough improvements.
- Champions take responsibility for Six Sigma implementation across the organization in an integrated manner. The Executive Leadership draws them from upper management. Champions also act as mentors to Black Belts.
- Master Black Belts, identified by champions, act as in-house coaches on Six Sigma. They devote 100% of their time to Six Sigma. They assist champions and guide Black Belts and Green Belts. Apart from statistical tasks, they spend their time on ensuring consistent application of Six Sigma across various functions and departments.
- Black Belts operate under Master Black Belts to apply Six Sigma methodology to specific projects. They devote 100% of their time to Six Sigma. They primarily focus on Six Sigma project execution, whereas Champions and Master Black Belts focus on identifying projects/functions for Six Sigma.
- Green Belts are the employees who take up Six Sigma implementation along with their other job responsibilities, operating under the guidance of Black Belts.

The term "six sigma process" comes from the notion that if one has six standard deviations between the process mean and the nearest specification limit, as shown in the graph, practically no items will fail to meet specifications. This is based on the calculation method employed in process capability studies.

Capability studies measure the number of standard deviations between the process mean and the nearest specification limit in sigma units, represented by the Greek letter σ (sigma). As process standard deviation goes up, or the mean of the process moves away from the center of the tolerance, fewer standard deviations will fit between the

mean and the nearest specification limit, decreasing the sigma number and increasing the likelihood of items outside specification.

(b) Statistical Process Control (SPC) Methods

Statistical process control (SPC) monitors specified quality characteristics of a product or service so as:

To detect whether the process has changed in a way that will affect product quality and

To measure the current quality of products or services.

- **Control** is maintained through the use of control charts. The charts have upper and lower control limits and the process is in control if sample measurements are between the limits.
- **Control Charts for Attributes**
  P Charts - measures proportion defective.
  C Charts - measures the number of defects/unit.

- **Control Charts for Variables**
  X bar and R charts are used together - control a process by ensuring that the sample average and range remain within limits for both.

- **Basic Procedure**
  1. An upper control limit (UCL) and a lower control limit (LCL) are set for the process.
  2. A random sample of the product or service is taken, and the specified quality characteristic is measured.
  3. If the average of the sample of the quality characteristic is higher than the upper control limit or lowers than the lower control limit, the process is considered to be "out of control".

(c) Malm Quist Index (MI)

The **Malmquist Index** (MI) is a bilateral index that can be used to compare the production technology of two economies. It is named after Professor Sten Malmquist, on whose ideas it is based. It is also called the Malmquist Productivity Index.

The MI is based on the concept of the Production function. This is a function of maximum possible production, with respect to a set of inputs pertaining to capital and labour. So, if S_a is the set of labour and capital inputs to the production function of Economy A, and Q is the production function of Economy A, we could write $Q = f_a(S_a)$.

While the production function would normally apply to an enterprise, it is possible to calculate it for an entire region or nation. This would be called the aggregate production function.

To calculate the Malmquist Index of economy A with respect to economy B, we must substitute the labour and capital inputs of economy A into the production function of B, and vice versa. The formula for MI is given below.

$$MI = \sqrt{(Q_1 Q_2)/(Q_3 Q_4)}$$

Where

$$Q_1 = f_a(S_a)$$
$$Q_2 = f_a(S_b)$$
$$Q_3 = f_b(S_a)$$
$$Q_4 = f_b(S_b)$$

Note that the MI of A with respect to B is the reciprocal of the MI of B with respect to A. If the MI of A with respect to B is greater than 1, the aggregate production technology of economy A is superior to that of economy B.

23 (a) What is Principal Component Analysis (PCA)?

(b) After adopting Total Productivity Maintenance, what types of benefit will your organization get?

(c) Define the following terms in the context of Supply Chain Management:

(i)Activity Based Management, (ii) Capacity Management, (iii) Customer Relationship Management, (iv) Customer Value, (v) Information Sharing, (vi) Lean Manufacturing.

Answer of 23:

(a) Principal Components Analysis is a method that reduces data dimensionality by performing a covariance analysis between factors. As such, it is suitable for data sets in multiple dimensions, such as a large experiment in gene expression. Let's take an example that illustrates how PCA works with a microarray experiment: Say that you measure 10,000 genes in 8 different patients. These values could form a matrix of 8 x 10,000 measurements. Now imagine that each of these 10,000 genes is plotted in a multi-dimensional on a scatter plot consisting of 8 axes, 1 for each patient. The result is a cloud of values in multi-dimensional space. To characterize the trends exhibited by this data, PCA extracts directions where the cloud is more extended. For instance, if the cloud is shaped like a football, the main direction of the data would be a midline or axis along the length of the football. This is called the first component, or the principal component. PCA will then look for the next direction, orthogonal to the first one, reducing the multidimensional cloud into a two-dimensional space.

(b) With the adoption of TPM at the enterprise level, your organization would benefit from the following aspect:

- A set of new management goals will be developed by the Management, using the skills and training provided during the implementation of the TPM
- Team bonding and better accountability
- Improved quality and total cost competitiveness
- Productivity and quality team training for problem solving
- Earlier detection of factors critical to maintaining equipment "uptime"
- Measure impact of defects, sub-optimal performance, and downtime using OEE (Overall Equipment Effectiveness)
- Motivated people function better all the time

(c) (i) Activity-Based Management (ABM)

The use of activity-based costing information about cost pools and drivers, activity analysis, and business processes to identify business strategies; improve product design, manufacturing, and distribution; and remove waste from operations.

(ii) Capacity Management

The function of establishing, measuring, monitoring, and adjusting limits or levels of capacity in order to execute all manufacturing schedules; i.e., the production plan, master production schedule, material requirements plan, and dispatch list. Capacity management is executed at four levels: resource requirements planning, rough-cut capacity planning, capacity requirements planning, and input/output control.

(iii) Customer Relationship Management (CRM)

A marketing philosophy based on putting the customer first. It involves the collection and analysis of information designed for sales and marketing decision support to understand and support existing and potential customer needs. It includes account management, catalog and order entry, payment processing, credits and adjustments, and other functions.

(iv) Customer Value

The customer value approach focuses on how people choose among competing suppliers, customer attraction and retention, and market-share gains.

By highlighting the best performer on each key buying factor, marketers obtain a market derived, empirical aggregate of each supplier's customer value proposition. Often the view from the marketplace differs from the organization's internally developed customer value proposition

(v) Information Sharing

A strategic partnering relationship between suppliers and buyers is characterized by a willingness to be open, and to share forecasted demand and cost data as well as the benefits resulting from the information sharing. Both parties in the relationship generally follow a continuous improvement philosophy towards total cost of material acquisition and ownership along with quality and service. Cost, quality and schedule information that is confidential is shared both ways between firms during the early and ongoing stages of design and during the production life-cycle of the supplying relationship. This openness exists because of the high degree of trust earned through multiple successful interactions between the two organizations.

(vi) Lean Manufacturing

A philosophy of production that emphasizes the minimization of the amount of all the resources (including time) used in the various activities of the enterprise. It involves identifying and eliminating non-value-adding activities in design, production, supply chain management, and dealing with the customers. Lean producers employ teams of multi skilled workers at all levels of the organization and use highly flexible, increasingly automated machines to produce volumes of products in potentially enormous variety. It contains a set of principles and practices to reduce cost through the relentless removal of waste and through the simplification of all manufacturing and support processes.

24 (a) Describe about On – Line Analytical Processing [OLAP] and Decision Support Systems.

(b) "The technology stack is designed to highlight the different layers of technology that will be affected by a BI project" – Mentioning the different layer for justifying the statement.

(c) Explain about the Spread Sheet.

Answer of 24:

(a) On-Line Analytical Processing (OLAP)

On-Line Analytical Processing (OLAP) is a category of software technology that enables analysts, managers and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information that has been transformed from raw data to reflect the real dimensionality of the enterprise as understood by the user.

OLAP functionality is characterized by dynamic multi-dimensional analysis of consolidated enterprise data supporting end user analytical and navigational activities including:

- calculations and modeling applied across dimensions, through hierarchies and/or across members
- trend analysis over sequential time periods

- slicing subsets for on-screen viewing
- drill-down to deeper levels of consolidation
- reach-through to underlying detail data
- rotation to new dimensional comparisons in the viewing area

OLAP is implemented in a multi-user client/server mode and offers consistently rapid response to queries, regardless of database size and complexity. OLAP helps the user synthesize enterprise information through comparative, personalized viewing, as well as through analysis of historical and projected data in various "what-if" data model scenarios. This is achieved through use of an OLAP Server.

Decision Support Systems

In a world of constant flux, informed and thoughtful decision-making is the cornerstone of business success. As a manager, you must make decisions that affect your business every day, some critical and some not so important. Decision Support Systems allow faster decision making, identification of negative trends, and better allocation of business resources all to the benefit of you and your organization.

Decision Support Systems - DSS - are a specific class of computer-based information systems that support your decision-making activities. A decision support system analyzes business data and provides interactive information support to managers and business professionals during the decision-making process, from problem recognition to implementing your decision. Decision Support Systems use (1) Analytical models, (2) specialized databases, (3) a decision maker's own insights and judgments, and (4) an interactive, computer-based modeling process to support semi-structured business decisions.

A key component to any DSS is Business Intelligence reporting tools, processes, and methodologies. These provide you with rich reporting, monitoring, and data analysis, which are necessary for effective and fast decision-making.

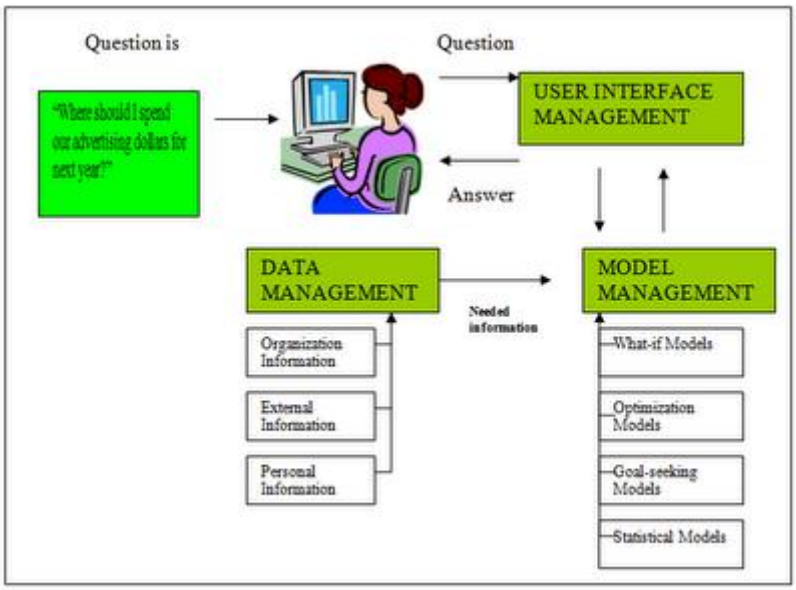
Gain competitive advantage with Decision Support Systems In today's competitive business environment, what you need for maximum performance is to achieve competitive advantage. Without competitive advantage, your company will not be able to operate and will eventually cease to exist.

One way of gaining competitive advantage is through the use of computerized Decision Support Systems. The simplest and most tangible benefit of a Decision Support System is the ability to help you toward making better decisions. Your decisions are better in the sense that, once they are implemented, they have such effect as reducing costs, using assets more efficiently, increasing revenue, reducing risks, improving customer service, and so on.

However, Decision Support Systems can provide your company with many other benefits including:

- Speeding up process of decision making
- Increasing organizational control
- Speeding up problem solving in an organization
- Helping automate managerial processes
- Improving personal efficiency
- Eliminating value chain activities

Components of Decision Support Systems



Decision support systems vary greatly in application and complexity, but they all share specific features. Typical **Decision support system has** four components: data management, model management, knowledge management and user interface management.

(i) Data Management Component

The data management component performs the function of storing and maintaining the information that you want your **Decision Support System** to use. The data management component, therefore, consists of both the Decision Support System information and the Decision Support System database management system. In **Data Management Component Decision Support System** comes from one or more of three sources:

- **Organizational information:** you may want to use virtually any information available in the organization for your Decision Support System. What you use, of course, depends on what you need and whether it is available. You can design your Decision Support System to access this information directly from your company's database and data warehouse. However, specific information is often copied to the Decision Support System database to save time in searching through the organization's database and data warehouses.
- **External information:** some decisions require input from external sources of information. Various branches of federal government, Dow Jones, and the internet, to mention just a few, can provide additional information for the use with a Decision Support System.
- **Personal information:** you can incorporate your own insights and experience your personal information into your Decision Support System. You can design your Decision Support System so that you enter this personal information only as needed, or you can keep the information in a personal database that is accessible by the Decision Support System.

(ii) Model Management Component

The model management component consists of both the Decision Support System models and the Decision Support System model management system. A model is a representation of some event, fact, or situation. As it is not always practical, or wise, to experiment with reality, people build models and use them for experimentation. Models can take various forms.

Businesses use models to represent variables and their relationships. For example, you would use a statistical model called analysis of variance to determine whether newspaper, TV, and billboard advertizing are equally effective in increasing sales.

Decision Support Systems help in various decision-making situations by utilizing models that allow you to analyze information in many different ways. The models you use in a Decision Support System depend on the decision you are making and, consequently, the kind of analysis you require. For example, you would use what-if analysis to see what effect the change of one or more variables will have on other variables, or optimization to find the most profitable solution given operating restrictions and limited resources. Spreadsheet software such as excel can be used as a Decision Support System for what-if analysis.

The model management system stores and maintains the Decision Support System's models. Its function of managing models is similar to that of a database management system. The model management component cannot select the best model for you to use for a particular problem that requires your expertise but it can help you create and manipulate models quickly and easily.

(iii) User Interface Management Component

The user interface management component allows you to communicate with the Decision Support System. It consists of the user interface management system. This is the component that allows you to combine your know-how with the storage and processing capabilities of the computer.

The user interface is the part of the system you see through it when enter information, commands, and models. This is the only component of the system with which you have direct contract. If you have a Decision Support System with a poorly designed user interface, if it is too rigid or too cumbersome to use, you simply won't use it no matter what its capabilities. The best user interface uses your terminology and methods and is flexible, Consistent, simple, and adaptable.

(b) To build a Business Intelligence solution, enterprises will need to consider new investments and upgrades to current technology to build out the BI technology stack. The technology stack is designed to highlight the different layers of technology that will be affected by a BI project, all the way from the hardware hosting your data at the bottom of the stack to the portal product used to present information to users at the top. Starting from the bottom, this seven-layer stack includes:

1. **Storage and computing hardware:** To implement BI, firms will need to invest or upgrade their data storage infrastructure. This includes Storage Area Networks (SAN), Network Attached Storage (NAS), Hierarchical Storage Management (HSM), and silo-style tape libraries. The trend over the next five years is for storage resources to be amalgamated into a single, policy-managed, enterprise-wide storage pool.
2. **Applications and data sources:** To develop an effective BI solution, source data will need to be scrubbed and organized. The challenge is that source data can come from any number of applications, most using proprietary data formats and application-specific data structures. Customer Relationship Management

(CRM), Supply Chain Management (SCM), and Enterprise Resource Planning (ERP) systems and other applications are the common sources of data. The trend over the next five years will be for applications to standardize the data format using extensible Markup Language (XML) schema and leverage BI specific standards like XML for Analysis.

3. **Data integration:** Middleware allows different systems supporting different communication protocols, interfaces, object models, and data formats to communicate. Firms will need to invest in these "connectors" to allow data from source applications to be integrated with the BI repository. Extraction, transformation and loading (ETL) tools pull data from multiple sources, and load the data into a data warehouse. Again, the trend in data integration and Enterprise Application Integration, in general, is toward standardization through XML and web services.
4. **Relational databases and data warehouses**: Firms will need a data warehouse to store and organize tactical or historical information in a relational database. Organizing data in this way allows the user to extract and assemble specific data elements from a complete dataset to perform a variety of analyses.
5. **OLAP applications and analytic engines:** Online analytic processing (OLAP) applications provide a layer of separation between the storage repository and the end user's analytic application of choice. Its role is to perform special analytical functions that require high-performance processing power and more specialized analytical skills.
6. **Analytic applications:** Analytic applications are the programs used to run queries against the data to perform either "slide-and-dice" analysis of historical data or more predictive analyses, often referred to as "drill-down" analysis. For example, a customer intelligence application might enable a historical analysis of customer orders and payment history. Alternatively, users could drill down to understand how changing a price might affect future sales in a specific region.
7. **Information presentation and delivery products:** The results of a query can be returned to the user in a variety of ways. Many tools provide presentation through the analytic application itself and offer dashboard formats to aggregate multiple queries. Also, enterprises can purchase packaged or custom reporting products, such as Crystal Reports. An important trend in BI presentation is leveraging XML to deliver analyses through a portal or any other Internet-enabled interface, such as a personal digital assistant (PDA).

(c) Spread Sheet

A **spreadsheet** is a program designed specifically for processing data in tabular form. These data may be numerical or textual, although most of the functions of a spreadsheet are for the former kind.

The spreadsheet is modeled on the paper device once used by accountants for tabulating numerical figures—a large sheet of paper spread out to show the financial state of a business. Apart from its ease of correction the electronic version differs from the paper spreadsheet principally in its database and numerical functions, most notably sorting and the ability to display the results of formulae which depend on values entered elsewhere in the sheet. Automatic calculation and graphical display have meant a radical increase in speculative, "as if" presentations, which has made the spreadsheet an essential tool of all commercial business and certain kinds of academic research. The rapidity with which graphical displays may be generated from quantitative information represents a potential for communication of facts and ideas that may as easily be abused as used. Hence the increased need, explored in this course, for understanding visual forms.

Spreadsheet software allows you to

- create simple lists and tables of alphabetic or numerical data
- create and manipulate simple (flat-file) databases

- establish relationships between sets of numerical data
- apply arithmetic, mathematical or statistical functions to numerical datasets
- represent datasets in graphical or chart form

In the humanities, potential uses of spreadsheets include:

- maintaining lists of short items you wish to sort, e.g. vocabulary, categories, instances of phenomena
- studying quantifiable information, such as word-distributions across textual corpora; demographics; other sociological statistics; voting patterns; inventories; etc.
- managing budgets, e.g. for grant applications and project expenses

25. Statistical Quality Control in the Packaging Industries - Case Study

Statistical quality control (SQC) is a necessary part of the production and use of modern packaging materials. The software chosen to satisfy basic SQC needs will determine whether it is an awkward, intrusive task or a smoothly operating part of the process. SQC software must not only collect quality data and produce control charts, but also provide the capabilities that make it the core of a well run and effective quality system.

The successful implementation of Statistical Quality Control (SQC) begins with the selection of the tools and methods best suited to the company's quality goals. Because manual charting can be burdensome and time-consuming, PC-based SQC using specialized software is preferable for routine charting and essential for process improvement studies. Numerous PC-based SQC software packages are readily available. Most, however, were developed for discrete manufacturing, particularly the automotive sector, and may not suit the diversified needs of modern packaging manufacturers and packaging users. When evaluating SQC software, packaging producers and manufacturers need to be aware of such shortcomings when making their selection.

Required:

(a) What is Statistical Process Control?

(b) Why Statistical quality control (SQC) is selected by the Packing Industry?

(c) What are the shortcomings of the SQC after the selection?

Answer of 25:

(a) Statistical process control (SPC):

A statistical tool that involves inspecting a random sample of the output from a process and deciding whether the process is producing products with characteristics that fall within a predetermined range. Statistical process control (SPC) tools are used most frequently because they identify quality problems during the production process. For this reason, we will devote most of the chapter to this category of tools. The quality control tools we will be learning about do not only measure the value of a quality characteristic. They also help us identify a *change* or variation in some quality characteristic of the product or process. We will first see what types of variation we can observe when measuring quality. Then we will be able to identify specific tools used for measuring this variation.

(b) The successful implementation of Statistical Quality Control (SQC) begins with the selection of the tools and methods best suited to the company's quality goals. Because manual charting can be burdensome and time-consuming, PC-based SQC using specialized software is preferable for routine charting and essential for process improvement studies. Numerous PC-based SQC software packages are readily available.

(c) Most, however, were developed for discrete manufacturing, particularly the automotive sector, and may not suit the diversified needs of modern packaging manufacturers and packaging users. When evaluating SQC software, packaging producers and manufacturers need to be aware of such shortcomings when making their selection.

SECTION - C

26 (a) Describe the Asset Liability Management Model in the perspective of Corporate Risk Management.
(b) Explain the objectives of Risk Management.
(c) Discuss the benefits of Risk Mapping.

Answer of 26:
(a) Asset Liability Management Model
Risks encountered in portfolio management need to be addressed more emphatically. In passive portfolio management, normally the mean variance and mean absolute deviation are employed to arrive at an optimal fixed mix strategy. However, this method does not recognize the high volatility in financial markets and as such the volatility risk is not addressed. However, active portfolio management is more aggressive, and involves reviewing the initial investment strategy every time rebalancing of the portfolio is required. Carino and Turner (1998) present the superiority of dynamic asset allocation framework using stochastic programming applications. Any financial planning strategy should be such that the mix of asset classes in a portfolio is able to grow and satisfy future goals with the best possible returns. This is the crux of asset liability management.
Asset liability management applications with the aid of stochastic programming conceptualize the problem of creating a portfolio by allocating a set of assets. The investor needs to decide the three factors, namely:

- Amount of assets to buy
- Amount of assets to sell
- Amount of assets to hold

The indices are defined and the problem parameters and decision variables are set out so that the stochastic programming model can develop a solution.
In this deterministic model, uncertainty is introduced to take care of risk. A refinement to the deterministic model is to apply a more sophisticated technique for estimation of asset prices that takes into consideration any unusual occurrence in the market as well as volatility. Sub-models based on randomness are introduced into the programming to take care of the risk as well. The randomness introduced is able to generate a set of scenarios which can be incorporated into the optimization model.
This model can be further improved using a two-stage stochastic program because an investor tries to use this model for making a contingent decision involving future risk. The first stage involves fixing a time period for stage two observation followed by finally taking a decision. The observation part of it can be likened to a 'wait and see' period of observation.
Asset liability management model can also be conceptualized as a method to compute the matching of assets and liabilities to generate a cautious investment portfolio. The purpose of this model is to optimize risk-adjusted returns to the shareholders over a long run. Two approaches for matching assets and liabilities are as follows:

Duration: This is defined as a measure of price sensitivity in relation to interest rates. It refers to the weighted average maturity where the weights are applied in terms of present value. This can be represented by the following formula:

Modified duration =Duration / [1+ (Yield to maturity/Number of coupon payments per year)]

Convexity: This is defined as the change in duration corresponding to changes in yield as follows:
Convexity = $(P_+ + P_- - 2P_0)/ 2P_o ((\Delta i)^2)$
Where,

Δ i = Change in yield (in decimals)
P_o = Initial price
P_+ = Price if yields increase by Δi
P_- =Price if yields decline by Δi
Combining convexity and duration is a good approach to examining the influence on change in yield on the market values of assets and liabilities.
The asset management model can also be employed to manage liquidity risk. Assets and liabilities can be arranged according to their maturity pattern in a time frame. Applying gap analysis, the differential between maturing assets and maturing liabilities are computed. If the gap is positive, then assets exceed liabilities; if it is negative, infusion of funds would be necessary either through sale of assets or creating new liabilities or a rollover of existing liabilities.
This model can also be applied to exchange rate risk management. Financial institutions match their assets and liabilities at a particular exchange rate. Fluctuations in the exchange rate obviously disturb the balance. This risk is corrected by matching the assets and liabilities in the same currency. The risk of foreign exchange borrowings can also be passed on to the lenders through foreign currency loans. The uncovered borrowings can be hedged through forward covers for the entire amount.

(b) Objectives of Risk Management

Risk management basically has the following objectives:

(i) Anticipating the uncertainty and the degree of uncertainty of the events not happening the way they are planned.
(ii) Channelizing events to happen the way they are planned.
(iii) Setting right, at the earliest opportunity, deviations from plans, whenever they occur.
(iv) Ensuring that the objective of the planned event is achieved by alternative means, when the means chosen proves wrong, and
(v) In case the expected event is frustrated, making the damage minimal.

(c) Benefits of risk mapping

- Promotes awareness of significant risks through priority ranking, facilitating the efficient planning of resources.
- Enables the delivery of solutions and services across the entire risk management value chain.
- Serves as a powerful aid to strategic business planning.
- Aids the development of an action plan for the effective management of significant risks.
- Assigns clear responsibilities to individuals for the management of particular risk areas.
- Provides an opportunity to leverage risk management as a competitive advantage.
- Facilitates the development of a strategic approach to insurance programme design.

- Supports the design of the client's risk financing and insurance programmes, through the development of effective/optimal retention levels and scope of coverage etc.

27 (a) Explain about the Total Loss Distribution and Probability of Ruin
(b) Describe the Transition Risk in the context of Corporate Risk Management.
(c) State the reasons for Implementing of Enterprise Risk Management.

Answer of 27

(a) Total Loss Distribution

Probability distributions can be very useful tools for evaluating the expected frequency and/or severity of losses due to identified risks. In risk management, two types of probability distribution are used: empirical and theoretical. To form an empirical probability distribution, the risk manager actually observes the events that occur, as explained in the previous section. To create a theoretical probability distribution, a mathematical formula is used. To effectively use such distributions, the risk manager must be reasonably confident that the distribution of the firm's losses is similar to the theoretical distribution chosen.

Three theoretical probability distributions that are widely used in risk management are: the binomial, normal, and poison.

Probability of Ruin

Ruin theory also known as collective risk theory, was actually developed by the insurance industry for studying the insurers vulnerability to insolvency using mathematical modeling. It is based on the derivation of many ruin-related measures and quantities and specifically includes the probability of ultimate ruin. This can be also related to the sphere of applied probability as the techniques used in the ruin theory as fundamentally arising out of stochastic processes. Many problems in ruin theory relate to real-life actuarial studies but the mathematical aspects of ruin theory have really been of interest to actuarial scientists and other business research people.
Normally an insurers' surplus has been computed as the net of two opposing cash flows, namely, cash inflow of premium income collected continuously at the rate of c and the cash outflow due to a series of insurance claims that are mutually independent and identically distributed with a common distribution function P(y). The path of the series of claims is assumed to respond to a Poisson process with intensity rate λ which would mean that the number of claims received N(t) at a time frame of t is controlled by a Poisson distribution with a mean λ_t. Therefore, the insurer's surplus at any time t is represented by the following-formula:

$$X(t) = x + ct - \sum_{i=0}^{N(t)} Y_i$$

where, the business of the insurer starts with an initial level of surplus capital.
X(0) = x under probability measure as explained in the previous paragraph.

Towards the end of the 20th century, Garbur and Shiu introduced the concept of the expected discounted penalty function derived from the probability of ultimate ruin. This concept was utilized to gauge the behaviour of insurer's surplus using the following formula:

$$m(x) = E^x \left[e^{-\delta T} K_T \right]$$

where, δ is the discounting force of interest, K_T is a general penalty function representing the economic costs of the insurer at the time of ruin and the expectation

relates to the probability measure. Quite a few ruin-related quantities fall into the category of the expected discounted penalty function.
In short, this theory of the probability of ruin is applied in the case of risk of insolvency of a company with diversified business activity. For the purpose of study, resources between diversified activities are allowed to be transferred and are limited by costs of transaction. Terminal insolvency happens when capital transfers between the business lines are not able to compensate the negative positions. Actuarial calculations are involved in the determination of ultimate ruin as discussed.

(b) Transition Risk
Risk usually arises when technological obsolescence suddenly overtakes the company. This risk can be traced partly to the complacencies developed by the firms in certain industries under a protected economy when a favourable import duty structure is levied by the Government so that the indigenous industry is able to thrive. However, these approaches have led to a state where these protected companies, become secure due to their continuing profitability and do not recognize the obsolescence of their technology as they are insulated from the onslaught of new technology.
Many industrial estates in India that thrived during the middle of the 20th century came to grief towards the end of the century when globalization and liberalization gained pace hand in hand. This was because the state-of-the-art technology that was espoused by advanced nations helped place their products with better quality at lower prices. This phenomenon has also happened in the IT field when new products were introduced very frequently based on new technology. The life of a technology which had been normally a decade or more, today suddenly finds itself reduced to a period of less than five years. This unexpected change of events in the history of IT has posed a transition risk for many industries. Technology has made many factors of productions namely men, machinery, and capital suddenly redundant.
As the time frame required for a turnaround or transition from one technology to another differs, companies face transition risk, according to their preparedness and their position in the life cycle. In addition, consumer behaviour has become an enigma clue to the wide variation and aspiration of different customers. This wide variety in the requirements of customers is also one of the factors leading to the extinction of technology that is no longer relevant to the customer, such as the case of black and white televisions.

(c) Need for Implementation of ERM
ERM needs to be implemented for the following reasons:
(i) Reduce unacceptable performance variability.
(ii) Align and integrate varying views of risk management.
(iii) Build confidence of investment community and stakeholders.
(iv) Enhance corporate governance.
(v) Successfully respond to a changing business environment.
(vi) Align strategy and corporate culture.

Traditional risk management approaches are focused on protecting the tangible assets reported on a company's Balance Sheet and the related contractual rights and obligations. The emphasis of ERM, however, is on enhancing business strategy. The scope and application of ERM is much broader than protecting physical and financial assets. With an ERM approach, the scope of risk management is enterprise-wide and the application of risk management is targeted to enhancing as well as protecting the unique combination of tangible and intangible assets comprising the organization's business model.

28 (a) Distinguish between Basel 1 and Basel 2.
(b) Explain the Value at Risk.
(c) Describe about the Risk Retention.

Answer of 28:

(a) Comparison between Basel I and Basel II

Basel - 1(1988 and amended in 1996) – Based on Methodology for Capital Adequacy	**Basel- II (to be in place by 2006 in G-10 countries and in India in 2008)- Basel II based on 3 pillars**
1. Capital adequacy based on Risk Weighted Assets	1. Capital adequacy based on Risk Weighted Assets)
2. Not risk sensitive. Prescriptive.	2. Risk sensitive.
3. All credit exposures carried risk weight of 100 per cent - except for some sovereign exposures and mortgages	3. Credit exposures carry risk weights based on credit qualities.
4. Risk Capital = Credit exposure * Risk Weights * 8 per cent can have lesser Capital than others	4. Risk capital: Similar to Basel I. But efficient Banks can have lesser capital than others
Implications were • Every bank had to maintain same 8 per cent capital. Thus Banks with good quality assets had no incentives. As a result credit quality had to be lowered to increase returns • Low rated exposures were subsidized	■ Banks with good quality assets have incentives because they can manage with lower capital **Implications are** • Banks with good quality assets have incentives because they can manage with lower capital • Better quality assets requires lesser capital • Risk pricing can be done by banks based on credit risk perception • Provision exists for economic pricing by banks

(b) Value at Risk

Value at Risk (VaR) is one of the popular methods of measuring financial risks. There are different types of VaR—long-term VaR, marginal VaR, factor VaR, and shock VaR. VaR is also defined as the threshold value such that the probability of a portfolio making a market to a market loss over a specific time horizon exceeds this value. For example, if a portfolio stock has a one day 3 per cent VaR of ₹10 million, there is 0.03 probability that the portfolio may face a reduction in value by more than ₹10 million over a specific time period. This is on assuming that normal market operations and there is no trading. A loss which exceeds VaR threshold is known as 'VaR break'. VaR has applications in financial risk management, risk measurement, control and reporting. It can also be used in calculating regulatory capital.

VaR essentially identifies the boundary between normal days and extreme occurrences. The probability level is specified as 1 minus probability of a VaR Break. Normally VaR parameters are 1 per cent and 5 per cent probabilities and 1 day and 2 week horizons. While VaR represents loss, a negative VaR would indicate that a portfolio has a high probability for making profits.

There are two types of VaR—one is applied primarily in risk management and the other in risk measurement. For a manager who is managing financial risk, VaR is essentially a system and not just a number as it runs periodically and is compared with the movement of computed prices in opening positions over the particular time horizon. An interesting application of VaR is the governance of endowments, trusts and pension plans. VaR utilized for this purpose is to monitor risk.

VaR has the advantage of a structured methodology for critically analysing a risk that is available as part of management function. Daily publication of a number on time and with particular statistical data enables an organization to maintain a high objective standard. However, robust backup systems and assumptions regarding default need to be established. A quotation runs thus, 'risk taking institution that does not compute VaR might escape disaster but an institution that cannot compute VaR will not' according to Aaaron Brown.

Another advantage of VaR is that it differentiates risks into two regimes, that is, normal days and extreme occurrences. Inside the VaR limit, application of the conventional statistical methods is reliable. Out VaR limit risk should be analyzed with stress testing on the basis of data available on the long-term and in the broad market. Distribution losses beyond VaR point are both impossible and useless. As such the finance manager should concentrate on developing plans to limit the loss if possible or to survive the loss.

VaR as a risk measurement is usually reported with other risk measurements such as standard deviation, expected shortfall, partial derivatives of portfolio value, etc.

Application of VaR is to segregate extreme occurrences in a systematic way. They can be studied over the long-term in a qualitative manner on the basis of day-to-day movement of prices, both quantitatively and qualitatively. As VaR can at best be utilized to define risk as a market to market loss on a fixed portfolio over a fixed time horizon in normal markets, it is not useful in abnormal situations.

There has been criticism against VaR. It is said that this concept has led to excessive risk taking and leveraging by financial institutions. Again VaR is not sub-additive which means that VaR of a combined portfolio can be larger than the sum of the VaRs of its components.

(c) Risk Retention

This denotes acceptance of the loss or benefit arising out of a risk when it takes place. In short, it is also termed as self insurance. This strategy is viable when the risks are small enough to be transferred at a cost that may be higher than the loss arising out of the risk itself. On the other hand, the risk can be so big that it cannot be transferred or insured. Such risks will have to be phased out when the eventuality occurs. War is an example as also are 'Acts of God' such as earthquakes and floods. The reasons for risk retention can be cited as follows:

(i) While risk in a business is taken to increase its return, risk retention relates to such risks which have no relation to return but are part of an individual's life or organization or a company operational risk can be cited as such a risk that is inherent and needs to be accepted for retention.

(ii) Sometimes, such risks are so small that they are ignored and/or phased out when they surface.

(iii) This method is also useful when the probability of occurrence is very low and a reserve built within the system over a period can take care of such losses arising out of risk retention. This is normally resorted to in businesses against credit risks that are inherent due to marketing on credit basis.

(iv) In some cases, the subject, who is susceptible to risk, also becomes fully aware of the nature of risk. In these situations, there is a certain amount of preparedness in the system due to risk retention.

Certain guidelines relating to risk retention should be followed:

(i) Determine the risk retention level through proper estimation of risk using sales projections, cash flows, contracts, liquidated damages, and guarantees.
(ii) Though there is no precise formula for estimation of risks to be retained, statistical averages of such losses over a period of time give an indication to estimate such losses. For instance, bad debts occurring over a period of time are taken into consideration as an estimate to create a reserve for doubtful debts.
(iii) It is also necessary to ascertain the capacity for funding a loss arising out of retained risk that is the measure for transferring the risk beyond that level.

Risk retention as an exercise and a strategy is attempted mainly in the case of operational risk in business.

29.(a)"Symptoms are interrelated. The classic path to corporate failure starts with the company experiencing low profitability. This may be indicated by trends in the ratios for:
(i) Profit margin,(ii) Return on Capital Expenditure and (iii) Return on Net Assets" – Discuss it.

(b)"Several techniques have been developed to help in prediction why companies fail." – Describe the Altman: Z Score Model in this regard.

(c) Explain the Neural Network (NN) under the Corporate Bankruptcy Prediction Models.

Answer of 29:

(a) There are three classic symptoms of corporate failure. These are namely:

1. Low profitability
2. High gearing
3. Low liquidity

Each of these three symptoms may be indicated by trends in the company's accounts. Symptoms are interrelated. The classic path to corporate failure starts with the company experiencing low profitability. This may be indicated by trends in the ratios for:

- **Profit margin**
- **Return on Capital Expenditure**
- **Return on Net Assets**

A downward trend in profitability will raise the issue of whether and for how long the company can tolerate a return on capital that is below its cost of capital. If profitability problems become preoccupying, the failing of the company may seek additional funds and working capital by increasing its borrowings, whether in the form of short term or long-term debt. This increases the company's gearing, since the higher the proportion of borrowed funds, the higher the gearing within the capital structure. The increased debt burden may then aggravate the situation, particularly if the causes of the decreasing profitability have not been resolved.

The worsening profit situation must be used to finance an increased burden of interest and capital repayments. In the case of a publicly quoted company, this means that fewer and fewer funds will be available to finance dividend payments. It may become impossible to obtain external credit or to raise further equity funds.

Confidence in the company as an investment may wither away leaving the share price to collapse. If the company is sound, for instance, but ineptly managed, the best that can be hoped for is a takeover bid for what may be now a significantly undervalued investment.

At this point, a company may not be really failing but unfortunately, more often rescue attempts are not mounted. This may be because the company's management does not recognize the seriousness of the situation, or is by now too

heavily committed or too frightened to admit the truth to its stakeholders, when refinancing is attempted profits fail to cover payments leading to a cash flow crisis.

What are the causes of corporate failure, and can they be avoided? Numerous studies reveal the alarmingly high failure rate of business initiatives, and corporate survival rates have recently declined across the major European economies. This article examines the range of explanations for failure, before considering whether failure can sometimes even be 'good'.

After addressing growth strategies in the last Henley Manager Update, we'll now review recent writing on corporate failures. What are the causes of company failure and how can these be stopped? In what ways can companies learn from failure? Of course, not all failures in business actually lead to the failure of the business. There are, though, many examples in recent times of growth strategies that failed. Unilever, for example, embarked upon its well-published Path to Growth strategy in 2000. Since then, it has not only failed to grow profitably but has also seen its European sales decline. Part of the problem was in not being quicker to address emerging market trends, such as the one for low-carb diets. Similarly, Volkswagen embarked on a burst of growth in the late '90s by acquiring other well-known automobile brands, only to find these began competing against each other as competition intensified by the middle of this decade.

(b) The Altman Model: Z-Score

The Z-Score model is a quantitative model developed by Edward Altman in 1968, to predict bankruptcy or financial distress of a business. The Z-score is a multi variate formula that measures the financial health of a company and predicts the probability of bankruptcy within 2years. This model involves the use of a specified set of financial ratios and a statistical method known as a Multiple Discriminant Analysis. (MDA). The real world application of the Altman score successfully predicted 72% of bankruptcies two years prior to their failure.

The model of Altman is based on a linear analysis in which five measures are objectively weighted and summed to arrive at an overall score that then becomes the basis for classification of companies into one of the two a priori groupings that is bankrupt or non-bankrupt. These five indicators were then used to derive a Z-Score. These ratios can be obtained from corporations' financial statements.

The five Z-score constituent ratios are:

1. **Working Capital/Total Assets (WC/TA):-** a firm with negative working capital is likely to experience problems meeting its short-term obligations.
2. **Retained Earnings/Total Assets: -** Companies with this ratio high probably have a history of profitability and the ability to stand up to a bad year of losses.
3. **Earnings Before Interest & Tax/ Total Assets: -** An effective way of assessing a firm's ability to profit from its assets before things like interest and tax are deducted.
4. **Market Value of Equity/ Total Liabilities: -** A ratio that shows, if a firm were to become insolvent, how much the company's market value would declines before liabilities exceed assets.
5. **Sales/Total Assets: -** A measure of how management handles competition and how efficiently the firm uses assets to generate sales.

Based on the Multiple Discriminate Analysis, the general model can be described in the following form:

$Z=1.2WC/TA + 1.4\ RE/TE + 3.3\ EBIT/TA + 0.6\ MVE/TL + 1.0\ SL/TA$

Probability of failure according to the Z-Score result:

Z-Score	Probability of Failure
Less than 1.8	very High
Greater that 1.81 but less than 2.99	Not Sure
Greater than 3.0	Unlikely

Calculation of the Z-Score for a fictitious company where the different values are given to calculate the Z-Score.

Sales	25,678
Total Assets	49,579
Total liabilities	5,044
Retained earnings	177
Working Capital	-1,777
Earnings before interest and tax	2,605
Market value of Equity	10,098
Book value of Total Liabilities	5,044

The calculations of the ratios are as follows:

1. Working Capital/Total Assets (-1,777/ 49579) = -0.036
2. Retained Earnings/Total Assets (177/ 49579) =0.004
3. Earnings Before Interest & Tax/ Total Assets (2605/ 49579)= 0.053
4. Market Value of Equity/ Total Liabilities (10098/ 5044)= 2.00
5. Sales/Total Assets (25978/ 49579)=0.52

Thus according to the formula the answer should be:
Z=1.2(-0.036) + 1.4 (0.004) + 3.3 (0.053) + 0.6 (2.0) + 1.0(0.52)
Z= -0.04+ 0.01+0.17+1.20+0.52
Z=1.86
According to Altman, this company may or may not fail as it is greater than 1.81 but less than 2.99, which situates it neither on the safe side nor on the failure side.

(c) Neural Networks (NN)

Although capable of outperforming human brain in basic arithmetic calculations, computers are certainly inferior when it comes to tasks involving symbolic recognition like signs of bankruptcy in a firm. Neural networks are enthused by biological works related to brain and its nervous system to triumph over this lack of computational efficiency in computers. Neural networks perform the classification task, in response to impending signals of financial health of a firm, in the way a brain would do for example in deciding whether the food is salty or sweet by its taste signal.

Human brain is made up of certain types of neurons (nerve cells), which is the base of neuroscience. Neurons, in neural networks, are called 'processing elements' or 'nodes. Like real neurons, these nodes are connected to each other through 'weighted interconnections' (synapses in neuroscience terms). Nodes are organized in layers. Each node takes delivery of, joins, and converts input signals into a single output signal via weighted interconnections. This output signal is accepted as the classifying decision if it satisfies the researcher; otherwise it is transmitted again as an input signal to many other nodes (possibly including itself). Process keeps going until satisfaction is gained from researchers' point of view.

Perhaps the major task of any neural network is to determine appropriate weights to interconnections of different nodes. Neural networks perform this task by a training process in which knowledge about the relationship between input and output signals is learned following certain principle. This knowledge produces a distinct structure of nodes (in one of the network layers called 'hidden layer') and connection weights, which correctly classifies the objects into their respective known groups.

Technically, this process of mapping is termed as 'convergence'. Following a mathematical theorem, the network is always able to converge.

While predicting corporate bankruptcy, NN would take information on explanatory variables at input nodes via input layer. The hidden layer nodes, connected to input nodes through weighted interconnections, collect and process this information to suggest a probability of a firm getting failed or succeeded.

30 (a) "It is a fact that some companies perform well and that some underperform and some fails. In many, if not most cases, these companies are led by executives that are quite experienced. Below are some recommendations that can help to reduce the risk of failures of organizations"- Justify the statements.

(b) Explain the L. C. Gupta Model under the Predictions of Corporate Failure.

(c) Describe the causes of corporate failure and their examples.

Answer of 30 :

(a) Preventing Corporate Failures

It is a fact that some companies perform well and that some underperform and some fails. In many, if not most cases, these companies are led by executives that are quite experienced. Below are some recommendations that can help to reduce the risk of failures of organizations:

(i) Appointment of non-executive directors

The non-executive directors will bring their special expertise and knowledge on strategies, innovative ideas and business planning of the organization. They will monitor the work of the executive management and will help to resolve situations where conflict of interest arises. Overall, the non-executive directors will act as a Cross Check.

(ii) Audit committees

Very often, there is occurrence of fraud in management and financial reporting. The presence of the audit committees will help to resolve this problem. Audit committees have the potential to reduce the occurrence of fraud by creating an environment where there is both discipline and control.

(iii) Development of environment learning mechanism

Some organizations fail because they lose touch with their environment. Therefore, to counter this problem, there is a need to develop the environmental learning mechanism. Through it, new information can be brought on continuous basis. This is mainly done by carrying customer-feedback surveys. In this way, the organization can realign itself with the new needs and challenges.

(iv) Focus on research and development

Organizations can generate new knowledge by investing and focusing more on research and development. Thus, there will be more ideas how to make the products much better than that of their competitors.

It can be deducted that a director has a big responsibility that he has to assume there commendations mentioned above can help directors to reduce corporate failure, provided that the directors abide. Proper planning also is critical to the success of a business.

(b) Dr. L.C. Gupta's Sickness Prediction Model

Dr. L.C. Gupta made an attempt to distinguish between sick and non-sick companies on the basis of financial ratios. He used a simple non-parametric test for measuring the relative predicting power of different financial ratios. A mixed sample of sick and non-sick companies was made and the companies in the sample were arranged in a single ordered sequence from the smallest to the largest, according to the financial ratio that is tested for its predictive power. Let [profit after tax ÷ Net

worth] is a financial ratio that is to be tested for its predictive power. The companies in the sample are arranged in increasing order of this particular ratio. Let the sick companies be denoted by the letter 'S' and the non-sick ones by the letter 'N'. Let us assume that 8 sick companies and 8 non-sick companies are taken for building up the sample. When arranged in a sequential order as stated above, the sequence may result in any pattern as shown below:

(A) S -N-S-N-S-S-N-S-N-N-S-N-S-N-S-N
(B) S -S-S-S-S-S-S-S-N-N-N-N-N-N-N-N
(C) S -S-S-S-N-N-N-N-N-N-N-N-S-S-S-S
(D) S -S-S-N-S-S-N-N-S-S-N-N-S-N-N-N

Observing the pattern of occurrence of 'S' and 'N' a cutoff point is chosen to separate the sick group from the non-sick group. Companies that fall to the left of the cutoff point lie in the sick group while companies that fall to the right of the cutoff point lie in the non-sick group. The cutoff point is so chosen that the number of misclassifications is minimized. The ratio that showed the least percentage classification error at the earliest possible time is deemed to have the highest predicative power. Referring to the four patterns shown above, the pattern of sequence shown in (B) is the most accurate one since the cutoff point will be located exactly midway in the sample group and the percentage of classification error will be zero since there are no misclassifications. Pattern shown in (C) is bound to have a higher error since the sick companies are concentrated on both the extreme ends.

Dr. L.C. Gupta used Indian data on a sample of 41 textile companies of which 20 were sick companies and 21 were non-sick companies. He studied the predictive power of 63 financial ratios and observed that the following two ratios have comparatively better predictive power.
(i) (Earnings before Interest and Taxes) ÷ Sales
and
(ii) (Operating cash flow) ÷ Sales
[Note: Operating cash flow = profit after tax + depreciation]

(c) Causes Of Corporate Failure And Their Examples:

(i) Technological causes:

Traditional methods of doing work have been turned upside down by the development of new technology. If within an industry, there is failure to exploit information technology and new production technology, the firms can face serious problems and ultimately fail.

By using new technology, cost of production can be reduced and if an organization continues to use the old technology and its competitors start using the new technology; this can be detrimental to that organization. Due to high cost of production, it will have to sell its products at higher prices than its competitors and this will consequently reduced its sales and the organization can serious problems.

This situation was seen in the case of Mittal Steel Company taking over Arcelor Steel Company. Arcelor Steel Company was using its old technology to make steel while Mittal Steel Company was using the new technology and as a result, Mittal Steel Company was able to sell steel at lower price than Arcelor Steel Company due to its low cost of production. Arcelor Steel Company was approaching corporate failure and luckily, Mittal Steel Company merged with Arcelor Steel Company and became Arcelor Mittal Steel Company, thus preventing Arcelor from failure.

(ii) Working capital problems:

Organizations also face liquidity problems when they are in financial distress. Poor liquidity becomes apparent through the changes in the working capital of the organization as they have insufficient funds to manage their daily expenses.

Businesses, which rely only on one large customer or a few major customers, can face severe problems and this can be detrimental to the businesses. Losing such a customer can cause big problems and have negative impact on the cash flows of the businesses.

Besides, if such a customer becomes bankrupt, the situation can even become worst, as the firms will not be able to recover these debts.

(iii) Economic Distress:
A turndown in an economy can lead to corporate failures across a number of businesses. The level of activity will be reduced, thus affecting negatively the performance of firms in several industries. This cannot be avoided by businesses.

The recent economic crisis in the USA led to many cases of corporate failures. One of them is the insurance AIG insurance company. It is facing serious problems and it might close its door in the near future.

(iv) Mismanagement:
Inadequate internal management control or lack of managerial skills and experience is the cause of the majority of company failures. Some managers may lack strategic capability that is to recognize strengths, weaknesses, opportunities and threats of a given business environment. These managers tend to take poor decisions, which may have bad consequences afterwards.

Furthermore, managers of different department may not have the ability to work closely together. There are dispersed department objectives, each department will work for their own benefits not towards the goal of the company. This will bring failure in the company. One example can be WorldCom, where the finance and legal functions were scattered over several states and communication between these departments were poor.

(v) Over-Expansion and Diversification
Research has shown that dominant CEO is driven by the ultimate need to succeed for their own personal benefits. They neglect the objective set for the company and work for their self-interest. They want to achieve rapid growth of the company to increase their status and pay level. They may do so by acquisition and expansion.
The situation of over expansion may arise to the point that little focus is given to the core business and this can be harmful as the business may become fragment and unfocused. In addition, the companies may not understand the new business field. Enron and WorldCom can be an example for this situation where the managers did not understand how growing overcapacity would influence its investment and therefore did not comprehend the risks associated with it.

(vi) Fraud by Management
Management fraud is another factor responsible for corporate collapse. Ambitious managers may be influenced by personal greed. They manipulate financial statements and accounting reports. Managers are only interested in their pay checks and would make large increase in executive pay despite the fact that the company is facing poor financial situation. Dishonest managers will attempt to tamper and falsify business records in order to fool shareholders about the true financial situation of the company. These fraudulent acts or misconduct could indicate a serious lack of control. These frauds can lead to serious consequences:

loss of revenue, damage to credibility of the company, increased in operating expenses and decrease in operational efficiency.

(vii) Poorly Structured Board

Board of Directors is handpicked by CEO to be docile and they are encouraged by executive pay and generous benefits. These directors often lack the necessary competence and may not control business matters properly. These directors are often intimated by dominant CEO and do not have any say in decision making. Example Enron and WorldCom where poorly structured board was a contributor towards their failure.

(viii) Financial distress

Firms that become financially distressed are found to be under- performing relative to the other companies in their industry. Corporate failure is a process rooted in the management defects, resulting in poor decisions, leading to financial deterioration and finally corporate collapse. Financial distresses include the following reasons also low and declining profitability, investment Appraisal, Research and Development and technical insolvency amongst others.

A firm may fail, as its returns are negative or low. A firm that consistently reports operating losses probably experiences a decline in market value. If the firm fails to earn are turn greater than its cost of capital, it can be viewed as having failed. Falling profits have an obvious link with both financial and bankruptcy as the firm finds it is not generating enough money to meet its obligations as they fall due.

Another cause that will lead the company to fail is the investment appraisal. Many organizations run into difficulties as they fail to appraise investment projects carefully. The long-term nature of many projects means that outcomes are difficult to forecast and probabilities are usually subjective. "Big project gone wrong" is a common cause of decline. For example, the acquisition of a loser company, this has happen in the case for the failure of Parmalat Co Ltd of Italy, which made the acquisition of several losses making company where Inappropriate evaluation of the acquired company, its strengths and weaknesses.