PAPER – 17 - STRATEGIC PERFORMANCE MANAGEMENT

The following table lists the learning objectives and the verbs that appear in the syllabus learning aims and examination questions:

	Learning objectives	Verbs used	Definition
LEVEL C	KNOWLEDGE What you are expected to know	List	Make a list of
		State	Express, fully or clearly, the details/facts
		Define	Give the exact meaning of
	COMPREHENSION What you are expected to understand	Describe	Communicate the key features of
		Distinguish	Highlight the differences between
		Explain	Make clear or intelligible/ state the meaning or purpose of
		Identity	Recognize, establish or select after consideration
		Illustrate	Use an example to describe or explain something
	APPLICATION How you are expected to apply your knowledge	Apply	Put to practical use
		Calculate	Ascertain or reckon mathematically
		Demonstrate	Prove with certainty or exhibit by practical means
		Prepare	Make or get ready for use
		Reconcile	Make or prove consistent/ compatible
		Solve	Find an answer to
		Tabulate	Arrange in a table
	ANALYSIS How you are expected to analyse the detail of what you have learned	Analyse	Examine in detail the structure of
		Categorise	Place into a defined class or division
		Compare and contrast	Show the similarities and/or differences between
		Construct	Build up or compile
		Prioritise	Place in order of priority or sequence for action
		Produce	Create or bring into existence
	SYNTHESIS How you are expected to utilize the information gathered to reach an optimum conclusion by a process of reasoning	Discuss	Examine in detail by argument
		Interpret	Translate into intelligible or familiar terms
		Decide	To solve or conclude
	EVALUATION How you are expected to use your learning to evaluate, make decisions or recommendations	Advise	Counsel, inform or notify
		Evaluate	Appraise or asses the value of
		Recommend	Propose a course of action

Paper – 17 - Strategic Performance Management

This paper contains 10 questions, divide in three sections; Section A, Section B and Section C. In total 7 questions are to be answered.
From Section A, Question No. 1 is compulsory and answer any two questions from Section A (out of three questions – questions Nos. 2 to 4). From Section B, Answer any two questions (i.e. out of Question nos. 5 to 7). From Section C, Answer any two questions (i.e. out of question nos.8 to 10).
Students are requested to read the instructions against each individual question also. All workings must form part of your answer. Assumptions, if any, must be clearly indicated.

Section –A

[Question 1 is compulsory and answers any 2 from the rest. All questions carry equal marks]

1. Read the following case study and answer the following questions:
A Prominent Foreign Bank found itself in a precarious position: Its commercial loan volume was static, but the unit's operating costs were increasing annually. Customer responsiveness was adequate for the industry, but not the competitive advantage that the bank needed. Managers wanted to engage employees in an ongoing, continuous improvement culture.

Bank facilitated a week-long session attended by senior management from each of the four regional operations centers, as well as internal business partners from IT, HR, and Sales. The team's goal was to use Voice of the Customer (VOC) analytics to see the business through the eyes of their customers, eliminate process steps that added no value, and develop the best future state for loan processing. At the end of the workshop, the group had a vision for the future operations flow and an agreed-upon roadmap to get there.

Through a series of rapid improvement projects, groups of 8 to 12 employees worked to scrutinize a particular segment of the lending process and find ways to eliminate waste and improve the flow of work. Overall, six improvement projects were completed over a five month period, engaging employees across three locations to create a new workflow that would improve the experience for customers and employees — and lower costs for the bank. A limited two-week pilot was launched to further refine and evaluate the new process. Employees in one location set up the new process and then worked to iron out details in the live customer environment. A week-long evaluation period followed, where the collected data was analyzed and discussed.

The elimination of redundant and unnecessary steps in the lending process led to dramatic increases in loan processing speed and capability. Analysis of the results from the pilot showed that the target of 20 percent productivity improvement was met and exceeded by an additional 10-15 percent gain. The lead time necessary to process a loan transaction also decreased from 4-8 hours to 20-60 minutes. The bank validated those results with pilots at two other sites. The project team and management team had the confidence to plan the full-scale roll-out of the new process.

After full implementation of the new process, the bank was able to reduce:

- **Process steps from 140+ to 70**
- **Decision points from 20 to 14**
- **Physical hand-offs from 46 to 11; and electronic hand-offs from 16 to 14**
- **Operating expenses from $10 to $8 million**
- **Delivery time from 4-8 hours to 20-60 minutes with fewer errors and rework**

Required to:

(a) State the shortcomings faced by the foreign bank before developing the new process.

(b) Discuss the result achieved by the bank after implementing the new process.

(c) Describe the advantages achieved by the foreign bank after full implementation of the new process.

(d) Describe the steps taken by the bank to face the challenge. [4+5+5+6]

Answer of 1:

(a) Shortcomings of the foreign Bank:

- Commercial Loan Volume were Static
- Operating costs were increasing
- Customer responsiveness was not adequate.
- Redundant Loan processing steps to reduce the speed of lending process.

(b) The elimination of redundant and unnecessary steps in the lending process led to dramatic increases in loan processing speed and capability. Analysis of the results from the pilot showed that the target of 20 percent productivity improvement was met and exceeded by an additional 10-15 percent gain. The lead time necessary to process a loan transaction also decreased from 4-8 hours to 20-60 minutes. The bank validated those results with pilots at two other sites. The project team and management team had the confidence to plan the full-scale roll-out of the new process.

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2. (a) In a small town, there are only two stores that handle sundry goods – ABC and XYZ. The total number of customers is equally divided between the two, because price and quality of goods sold are equal. Both stores have good reputation in the community, and they are render equally good customer service. Assume that a gain of customer by ABC is a loss to XYZ and vice versa. Both stores plan to run annual pre Diwali sales during the first week of November. Sales are advertised through a local newspaper, radio and television media. With the aid of an advertising firm, store ABC constructed the game matrix given below. (Figures in the matrix represent a gain or loss of customers.)

Strategy of ABC	Strategy of XYZ		
	Newspaper	Radio	Television
Newspaper	**30**	**40**	**-80**
Radio	**0**	**15**	**-20**
Television	**90**	**20**	**50**

(b) Describe the different perspectives of Balanced Scorecard.

(c) "EVA is period-to-period computation, which can be used to monitor the process of value creation and record historically the growth of the enterprise. The MVA can be expressed as the present value of all EVAs." - Discuss the statement. [10+5+5]

Answer of 2:

(a) The game matrix, with row minima and column maxima, is reproduced below:

Strategy of ABC	Strategy of XYZ			Row Minima
	Newspaper	Radio	Television	
Newspaper	30	40	-80	-80
Radio	0	15	-20	-20
Television	90	20	50	20
Column Maxima	90	40	50	

Evidently, saddle point does not exist. Now, it may be observed that row 3 dominates row 2, and column 3 dominates column 1. Deleting R_2 and C_1, the game reduces to the order 2 × 2, as shown below:

	Radio	Television
Newspaper	40	-80
Television	20	50

With usual meaning of the symbols used, we have

$$x = \frac{a_{22} - a_{21}}{(a_{11} + a_{22}) - (a_{12} + a_{21})} = \frac{50 - 20}{(40 + 50) - (-80 + 20)} = \frac{30}{150} = \frac{1}{5}$$

$$y = \frac{a_{22} - a_{12}}{(a_{11} + a_{22}) - (a_{12} + a_{21})} = \frac{50 - (-80)}{(40 + 50) - (-80 + 20)} = \frac{130}{150} = \frac{13}{15}$$

$$v = \frac{(a_{11} + a_{22}) - (a_{12} + a_{21})}{(a_{11} + a_{22}) - (a_{12} + a_{21})} = \frac{(40 \times 50) + (80 \times 20)}{(40 + 50) - (-80 + 20)} = \frac{3,600}{150} = 24$$

Thus, optimal strategies are:

	Newspaper	Radio	Television
For ABC	1/5	0	4/5
For XYZ	0	13/15	2/15

Value of the game = 24.

(b) The Balanced Scorecard suggests that we view the organization from four perspectives, and to develop metrics, collect data and analyze it relative to each of the following perspectives:

Perspective:

The Learning & Growth Perspective:

This perspective includes employee training and corporate cultural attitudes related to both individual and corporate self-improvement. In a knowledge worker organization, people, the only repository of knowledge, are the main resource. In the current climate of rapid technological change, it is becoming necessary for knowledge workers to be in a

continuous learning mode. Kaplan and Norton emphasize that 'learning' is more than 'training'; it also includes things like mentors and tutors within the organization, as well as that ease of communication among workers that allows them to readily get help on a problem when it is needed.

The Business Process Perspective:

This perspective refers to internal business processes. Metrics based on this perspective allow the managers to know how well their business is running, and whether its products and services conform to customer requirements (the mission). These metrics have to be carefully designed by those who know these processes most intimately.

The Customer Perspective:

Recent management philosophy has shown an increasing realization of the importance of customer focus and customer satisfaction in any business. These are leading indicators. If customers are not satisfied; they will eventually find other suppliers that will meet their needs. Poor performance from this perspective is thus a leading indicator of future decline, even though the current financial picture may look good.

The Financial Perspective:

Kaplan and Norton do not disregard the traditional need for financial data. Timely and accurate funding data will always be a priority, and managers will do whatever necessary to provide it. In fact, often there is more than enough handling and processing of financial data. With the implementation of a corporate database, it is hoped that more of the processing can be centralized and automated. But the point is that the current emphasis on financials leads to the "unbalanced" situation with regard to other perspectives. There is perhaps a need to include additional financial-related data, such as risk assessment and cost-benefit data, in this category.

(c) The above statement said that the difference between Economic value Added and Market Value Added. Discuss it,

EVA is period-to-period computation, which can be used to monitor the process of value creation and record historically the growth of the enterprise. The MVA can be expressed as the present value of all EVAs. The MVA measures the total performance of the firm in economic terms since its inception. It is cumulative measure while the EVA is a single period measure, usually a year. A firm having a positive EVA is expected to have positive MVA and vice- versa. However, there can be a contradiction in MVA and EVA because the MVA is derived from the share prices, which are forward looking discounting the future potential, while the EVA records performance during a period. We may have negative EVA, yet a positive MVA due to the good potential of the firm.

According to the proponents of EVA other parameters of value like growth, rates of return and dividends do not matter. Growth in EPS will increase MVA only when investments earn more than the cost of capital. Similarly, the rates of return do not matter. What matters is the creation of absolute EVA. Likewise dividend and its growth will be inconsequential as long as the market value falls by the amount of dividend. MVA will be affected only when change in dividend signals some change in fundamental investment policy. The only way for creation of value is undertaking all the projects with positive NPV and rejecting all negative NPV Projects – the standard rule of capital budgeting. Once this is done, growth in both returns and dividend will take care of themselves automatically. This will lead to maximization of both EVA and MVA.

3.(a) Fruitolay has decided to increase the size of the store. It wants the information about the probability of the individual product lines: Lemon, Grapes and Papaya. It provides the following data for the year for each product line -

Particulars	Lemon	Grapes	Papaya
Revenues	**₹79,350**	**₹2,10,060**	**₹1,20,990**
Cost of Goods sold	**₹60,000**	**₹1,50,000**	**₹90,000**
Cost of Bottles Returned	**₹1,200.00**	**₹0**	**₹0**

Number of Purchase Orders	**36**	**84**	**36**
Number of Deliveries received	**30**	**219**	**66**
Hours of Shelf Stocking Time	**54**	**540**	**270**
Items sold	**12,600**	**1,10,400**	**30,660**

Fruitolay also provides the following information for the year:

	Activity	Description of Activity	Total costs	Cost Allocation Basis
1.	Bottle returns	Returning of Empty Bottles to the Store	1,200	Direct tracing to product line
2.	Ordering	Placing of orders of purchases	15,600	156 orders
3.	Delivery	Physical delivery & the receipt of merchandise	25,200	315 deliveries
4.	Shelf Stocking	Stocking of merchandise on store and ongoing re-stocking	17,280	964 hours of time
5.	Customer Support	Assistance provided to customers including bagging and check – out	30,720	1,53,600 item sold

Required:

(i) Fruitolay current allocates Store Support Costs (all Costs other than Cost of Goods Sold) to the product lines on the basis of the cost of Goods Sold of each product line. Calculate the Operating Income and Operating Income as the percentage of revenue of each product line.

(ii) If Fruitolay allocates Store Support Costs (all costs other than the Cost of Goods Sold) to the product lines on the basis of ABC System, calculate the Operating Income and Operating Income as the percentage of revenue of each product line.

(iii) Compare both the systems.

(b) State the steps to be considered in strategies Bench Trending.

(c)"EVA is period-to-period computation, which can be used to monitor the process of value creation and record historically the growth of the enterprise. The MVA can be expressed as the present value of all EVAs." - Discuss the statements.

(d) Describe the objectives of Performance Appraisal. [(3+4+3)+3+3+4]

Answer of 3:

(a) (i) Allocation based on Cost Of Goods Sold

- Total Support Costs = ₹1,200 + ₹15,600 + ₹25,200 + ₹17,280 + ₹30,720 = ₹90,000
- Total Cost of Goods Sold = ₹60,000 + ₹150,000 + ₹90,000 = ₹3,00,000

Hence, Ratio of Support Costs to COGS = (₹90,000 ÷ ₹3,00,000) x 100 = 30%

The Product Profit Statement is as under:

Particulars	Lemon (₹)	Grapes (₹)	Papaya (₹)	Total (₹)
Revenues	79,350	2,10,060	1,20,990	4,10,400
Less: cost of Goods Sold	60,000	1,50,000	90,000	3,00,000
Gross Margin	19,350	60,060	30,990	1,10,400
Less: Support Costs at 30%	18,000	45,000	27,000	90,000
Operating Income	**1,350**	**15,060**	**3,990**	**20,400**
Operating Income as % of Sales	**1.70%**	**7.17%**	**3.30%**	**4.97%**

(ii) Allocation based on Activity Based Costing

1st Computation of Activity based cost Driver Rates

Activity	Total Cost (₹)	Cost Allocation Base	ABC Rate
Bottles Returns	1,200	Direct tracing to soft – drink line	Directly allocated
Ordering	15,600	156 Purchase orders	₹100 per purchase order
Delivery	25,200	315 deliveries	₹80 per delivery
Shelf – stocking	17,280	864 hours of Self-stocking time	₹20 per hour
Customer Support	30,720	1,53,600 items sold	₹0.20 per item sold

2nd Product Profit Statement under ABC System is as under –

Particulars	Lemon (₹)	Grapes (₹)	Papaya (₹)	Total (₹)
Revenues	79,350	2,10,060	1,20,990	4,10,400
Less: Cost of Goods Sold	60,000	1,50,000	90,000	3,00,000
Gross Margin	19,350	60,060	30,990	1,10,400
Less: Activity Based cost				
Bottles Returns (direct)	1,200	Nil	Nil	1,200
Ordering at ₹100 per order	3,600	8,400	3,600	15,600
Delivery at ₹80 per delivery	2,400	17,520	5,280	25,200
Shelf – stocking at ₹20 ph	1,080	10,800	5,400	17,280
Customer support at 0.20 p.u.	2,520	22,080	6,120	30,720
Total Support Costs	10,800	58,800	20,400	90,000
Operating Income	**8,550**	**1,260**	**10,590**	**20,400**
Operating Income as % of Sales	**10.78%**	**0.60%**	**8.75%**	**4.97%**

Note: Cost of Bottles returned is presumed to have been already adjusted.

(iii) Comments:

1st : Under COGS- based OH Allocation, OH are taken at 30% of COGS, without recognizing the extent of resources consumed for each product line. Hence, ABC based OH Allocation provides a better analysis of costs.

2nd: Under ABC System, "Grapes" has a higher share of OH, on account of higher resource consumption. Hence, it shows a lower operating income % than under the earlier COGS – based Allocation System. The Company should identify possibilities of price increase in "Grapes" to recover resource – based costs.

3rd : "Lemon" has a higher operating Income % and is most profitable. Hence, the company should explore avenues for increasing sales of "Lemon".

(b) The Steps in Strategies Bench Trending are as follows:

(i) Firstly the market is defined by determining its size, customer preferences, competitors and relative business position of the company within the market.

(ii) The industry direction, technology shifts, geopolitical changes, customer changes and potential threats from outside sources are assessed.

(iii) The strongest current and potential competitors are then determined by evaluating the trends in industry.

(iv) Data on performance of competitors is gathered and the current and future performance of the unit is compared with that of its competitor.

(v) A performance baseline for the business units is then established and the relative performance of current and projected competition is estimated.

(vi) A set of initiatives which form the basis of an improvement plan are identified to maintain strengths while reducing projected gaps.

(c) The above statement said that the difference between Economic value Added and Market Value Added. Discuss it,

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(d) Components of Performance Management

(i) 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 reviewee 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.

(ii) 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 appraisee 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.

(iii) 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.

(iv) 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.

(v)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 appraisee and the appraiser and is mutually approved.

4. (a) List the Objectives of pricing Policy.

(b) The cost function is C = 100+q, where the product is sold at ₹ 5 per unit. Determine break even sales and profit when 125 units are sold.

(c) The total cost function of a firm C = $2x^3 - x^2 + 3x + 5$ where C is total cost and the Marginal Revenue = 8 – 3x, where x = output. Determine the most profitable output of the firm.

(d) A radio manufacturer produces 'x' sets per week at total cost of ₹ X^2+ 78x + 2500. He is a monopolist and the demand function for his product is x = $\frac{(600-P)}{8}$, when the price is 'p' per set. Show that maximum net revenue is obtained when 29 sets are produced per week. What is the monopoly price?

(e) "Methods of pricing policy can be classified into 5 broad categories. One of them on that category is pricing Policies based on Market Conditions. There are 5 different types of market in Economics and certainly there are different types of pricing policies - Monopoly and Oligopoly is not different." – Explain the above statement. [2+4+4+4+6]

Answer of 4:

(a) Objectives of a Pricing Policy

Each pricing decision of a firm has generally one of the following objectives:

- To achieve a given rate of return for the entire product line;
- To maintain or increase the existing market share of the firm;
- To maintain at least a particular level of price stability;
- To choose and adopt a price policy which fits into the market conditions faced by the different products in the product line;

(b) Let, Total Revenue (TR) = Pq = 5q [where, P = selling price per unit of the product
And, q = Quantity of the product]

And C = 100+q

For Break even TR = C $\Rightarrow$ 5q = 100+q $\Rightarrow$ q = 25

For Break even sales = 5 x 25 = ₹ 125

Again, say that Profit = π

Now π = TR - C = 5q – 100 □ □q =4q – 100.

As per question, q = 125, $\pi = 4 \times 125 - 100 = 400$
So, Break Even sales is ₹ 125 and Break even profit is ₹ 400

(c) $C = 2x^3 - x^2 + 3x + 5$
$MR = 8 - 3x$
$MC = \frac{dc}{dx} = 6x^2 - 2x + 3$
Profit Maximum at MC = MR
$6x^2 - 2x + 3 = 8 - 3x$
or, $6x^2 + x - 5 = 0$
or, $6x^2 + 6x - 5x - 5 = 0$
or, $6x(x+1) - 5(x+1) = 0$
or, $(x+1)(6x-5) = 0$
or, $x = -1$ or $\frac{5}{6}$
$\therefore x = \frac{5}{6}$

(d) Cost (C) = $x^2 + 78x + 2500$
Demand (D) X = (600 – P) / 8
8x = 600 – P
$\therefore$ P = 600 – 8x
Total Revenue for 'x' sets
Price x Quantity i.e., $600x - 8x^2$
Maximum revenue is obtains at MC = MR
Marginal Cost = $\frac{dc}{dx}$ = 2x + 78 – (i)
Marginal Revenue = $\frac{dr}{dx}$ = 600 – 16x – (ii)
Equity (i) & (ii)
2x +78 = 600 – 16x
or,18x = 522
$\therefore x = \frac{522}{18} = 29$
Monopoly price 600 – 8x
600 – 8 × 29
= 600 – 232 = 368

(e) The method pricing policies can be classified into 5 broad categories. These are
(i) Cost Oriented Pricing
(ii) Competition Oriented Pricing
(iii) Demand Oriented Pricing
(iv) Pricing Based on Other Economic Considerations
(v) Pricing Policies based on Market Conditions

Pricing based on market conditions can be classified into 6 categories. These are

(i) Perfect Competition
(ii) Monopoly
(iii) Temporary Monopoly
(iv) Duopoly
(v) Oligopoly
(vi) Monopolistic Competition

Monopoly:

Monopolies are almost always nationalized enterprises for which criterion for maximization of profit is not justifiable. In reality, a firm enjoys monopoly position only because it has succeeded in eliminating or absorbing its competitors. It is therefore probable that, initially, it was better organized and more efficient.

The technical advantages which are benefit large firms in certain branches of industry can also neutralize, at least partly, the harmful effects of a monopoly. Finally, "any defacto monopoly must be prepared to defend itself, on the one hand, against the emergence of substitute competitors and, on the other, against the competition of substitute products, which imposes a limitation on its profit realization".

In general, to prevent the entry of new firms, a monopolist must set entry-preventing prices, i.e., it should hold prices at a level which will tend to discourage new firms from entering that particular branch of industry. This presupposes an implicit estimation of production costs of possible competitors, and of the profits which will be required to attract them.

On the contrary, in order to fight the competition of substitute products, a monopoly must establish its price policy on the basis of a demand curve which will actually take those products into account. When the uses of goods produced by a monopoly are many, the degree of monopoly can vary enormously from one use to another. In case of coal, for instance, sales range from the industrial market- in which the fuel oil competition is extremely active – to blast furnace coke market – in which coal enjoys a technical monopoly.

So profit maximization demands that management collect more detailed econometric data in the environment of monopoly, than in that of perfect competition.

Oligopoly:

In oligopolistic situations, entrepreneurs attempt to avoid price wars which are ruinous for the industry. Being aware of the fact that their rivals can do the same, they refrain from seeking to increase their share of the market through price cuts. As a result, oligopoly can attain certain stability characterized by: a) the 'price leadership' of a firm, b) the reduction of hidden prices, and c) competition in fields other than that of price (like competition in fields other than that of price (like promotion, packaging, etc.). We have already discussed the nature of oligopoly pricing with the help of models.

Now, about the lowering of hidden prices. It can assume various forms. It is contingent upon the customer, upon the size of the order, upon the geographical area and the existence of inferior brands. This policy has the advantage that it precedes adjustments of official prices and in this way contributes to the stability of oligopolists.

Finally, non-price competition is a substitute for price competition. It is much less dangerous because its effects are felt in the long run. So the possibilities of reactions from competition are more limited.

Section – B

[Answer any 2 questions from this section]

5 (a) List the Advantages of these Data Envelopment Analysis.

(b) "Data quality management incorporates a virtuous cycle in which continuous analysis, observation, and improvement lead to overall improvement in the quality of organizational information across the board. This virtuous cycle incorporates five fundamental data quality management practices, which are ultimately implemented using a combination of core data services." – Discuss the five fundamentals. [5+5]

Answer of 5:

(a) 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.

(b) The objective of this cycle is to transition from being an organization in which the data stewards react to acute data failures into an organization that proactively controls and limits the introduction of data flaws into the environment.

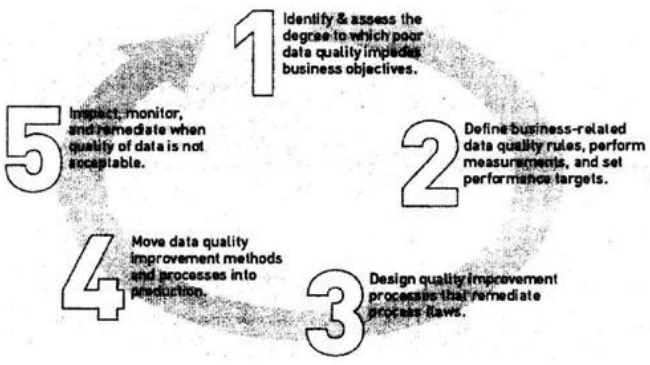
(i) Data quality assessment, as a way for the practitioner to understand the scope of how poor data quality affects the ways that the business processes are intended to run, and to develop a business case for data quality management;

(ii) Data quality measurement, in which the data quality analysts synthesize the results assessment and concentrate on the data elements that are deemed critical based on the selected business users' needs. This leads to the definition of performance metrics that feed management reporting via data quality scorecards;

(iii) Integrating data quality into the application infrastructure, by way of integrating data requirements analysis across the organization and by engineering data quality into the system development life cycle;

(iv) Operational data quality improvement, where data stewardship procedures are used to manage identified data quality rules, conformance to acceptability thresholds, supported by

(v) Data quality incident management, which allows the data quality analysts to review the degree to which the data does or does not meet the levels of acceptability, report, log, and track issues, and document the processes for remediation and improvement.



6. (a) Describe about the Long Short Term Memory of Recurrent Artificial Neural Networks Topologies.
(b) Describe about the different types of On-Line Analytical Processing. [5+5]

Answer of 6:

(a) Long Short Term Memory

Long Short Term Memory is one of the recurrent artificial neural networks topologies. In contrast with basic recurrent artificial neural networks it can learn from its experience to process, classify and predict time series with very long time lags of unknown size between important events. This makes Long Short Term Memory to outperform other recurrent artificial neural networks. Long Short Term Memory artificial neural network is build from Long Short Term Memory blocks that are capable of remembering value for any length of time. This is achieved when the input is significant enough remembering.

Architecture of Long Short Term Memory block is shown in the following figure where input layer consists of sigmoid units. Top neuron in the input layer process input value that might be sent to a memory unit depends on computed value of second neuron from the top in the input layer. The third neuron from the top in the input layer decide how long will memory unit hold (remember) its value and the bottom most neuron determines when value from memory should be released to the output. Neurons in first hidden layer and in output layer are doing simple multiplication of their inputs and a neuron in the second hidden layer computes simple linear function of its inputs. Output of the second hidden layer is fed back into input and first hidden layer in order to help making decisions.

(b) Types

OLAP systems have been traditionally categorized using the following taxonomy.

Multidimensional

MOLAP is a "multi-dimensional online analytical processing".'MOLAP' is the 'classic' form of OLAP and is sometimes referred to as just OLAP. MOLAP stores this data in optimized multidimensional array storage, rather than in a relational database. Therefore it requires the pre-computation and storage of information in the cube - the operation known as processing. MOLAP tools generally utilize a pre-calculated data set referred to as a data cube. The data cube contains all the possible answers to a given range of questions. MOLAP tools have a very fast response time and the ability to quickly write back data into the data set.

Relational

ROLAP works directly with relational databases. The base data and the dimension tables are stored as relational tables and new tables are created to hold the aggregated information. Depends on a specialized schema design. This methodology relies on manipulating the data stored in the relational database to give the appearance of traditional OLAP's slicing and dicing functionality. In essence, each action of slicing and dicing is equivalent to adding a "WHERE" clause in the SQL statement. ROLAP tools do not use pre-calculated data cubes but instead pose the query to the standard relational database and its tables in order to bring back the data required to answer the question. ROLAP tools feature the ability to ask any question because the methodology does not limit to the contents of a cube. ROLAP also has the ability to drill down to the lowest level of detail in the database.

Hybrid

There is no clear agreement across the industry as to what constitutes "Hybrid OLAP", except that a database will divide data between relational and specialized storage. For example, for some vendors, a HOLAP database will use relational tables to hold the larger quantities of detailed data, and use specialized storage for at least some aspects of the smaller quantities of more-aggregate or less-detailed data. HOLAP addresses the shortcomings of MOLAP and ROLAP by combining the capabilities of both approaches. HOLAP tools can utilize both pre-calculated cubes and relational data sources.

Other types

The following acronyms are also sometimes used, although they are not as widespread as the ones above:

- **WOLAP** - Web-based OLAP
- **DOLAP** - Desktop OLAP
- **RTOLAP** - Real-Time OLAP

7. (a) Discuss the potential impact of Computers and MIS on different levels of management.
(b) Mention any six objectives of Management Information Systems. [7+3]

Answer of 7:

(a) The potential impact of computers on top-level management may be quite significant. An important factor which may account for this change is the fast development in the area of computer science. It is believed that in future computers would be able to provide simulation models to assist top management in planning their work activities. For example, with the help of a computer it may be possible in future to develop a financial model by using simulation technique, which will facilitate the executives to test the impact of ideas and strategies formulated on future profitability and in determining the needs of funds and physical resources.

Futurists believe that top management will realize the significance of techniques like Simulation, Sensitivity Analysis and Management Science. The application of these techniques to business problems with the help of computers would generate accurate, reliable, timely and comprehensive information to top management. Such information would be quite useful for the purpose of managerial planning and decision-making. Computerized MIS will also influence in the development, evaluation and implementation of a solution to a problem under decision making process.

Potential Impact of Computers and MIS on middle management level will also be significant. It will bring a marked change in the process of their decision-making. At this level, most of the decisions will be programmed and thus will be made by the computer, thereby drastically reducing the requirement of middle level managers. For example, in the case of inventory control system, computers will carry records of all items in respect of their purchase, issue and balance. The re-order level, re-order quantity etc., for each item of material will also be stored in computer after its predetermination. Under such a system, as soon as the consumption level of a particular item of material will touch reorder level, computer will inform for its purchase immediately.

The impact of Computers and MIS today at supervisory management level is maximum. At this level, managers are responsible for routine, day-to-day decisions and activities of the organization which do not require much judgment and discretion. In a way, Supervisory manager's job is directed more towards control functions, which are highly receptive to computerization.

Potential impact of computers and MIS on supervisory level will completely revolutionize the working at this level. Most of the controls in future will be operated with the help of computers. Even the need of supervisory managers for controlling the operations will be substantially reduced. Most of the operations/activities now performed manually will be either fully or partially automated.

(b) Objectives of MIS

(i) To provide the managers at all levels with timely and accurate information for control of business activities

(ii) To highlight the critical factors in the operation of the business for appropriate decision making

(iii) To develop a systematic and regular process of communication within the organization on performance in different functional areas

(iv) To use the tools and techniques available under the system for programmed decision making

(v) To provide best services to customers
(vi) To gain competitive advantage
(vii) To provide information support for business planning for future

Section C
[Answer any 2 questions from this section]

8. (a) Discuss the needs for Implementation of ERM.
(b) State the objectives of Risk Management. [5+5]

Answer of 8:
(a)Need for Implementation of ERM
ERM needs to be implemented for the following reasons:

- Reduce unacceptable performance variability.
- Align and integrate varying views of risk management.
- Build confidence of investment community and stakeholders.
- Enhance corporate governance.
- Successfully respond to a changing business environment.
- Align strategy and corporate culture.

[Students may answer any 5 points out of 6]

(b)Objectives of Risk Management
Risk management basically has the following objectives:

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

9. Calculate Altman's Z score using multivariate analysis and assign the firm as failed or non-failed firm.

Sales	**10,00,000**
Operating expenses	**8,00,000**
Interest	**6,000**
Depreciation	**50,000**
Tax	**15,000**

Balance sheet

Equity & Liabilities	₹	Assets	₹
Shareholders' Fund:		**Non Current Assets:**	
Share Capital at ₹ 10 each	**1,00,000**	**Fixed Assets**	**1,50,000**
Reserve and surplus from retained earnings	**50,000**	**Current Assets:**	
Non Current Liabilities:		**Inventory**	**2,00,000**
6% long term loan	**1,00,000**	**Sundry debtors**	**1,10,000**
Current Liabilities:		**Loans and Advances**	**40,000**
Sundry creditors	**2,00,000**	**Cash at Bank**	**50,000**
Provision for tax	**1,00,000**		
	5,50,000		**5,50,000**

Market value per share is ₹ 8. [10]

Answer of 9:

The equation of Z Score as developed by Altman is,

$Z = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5$

$X_1 = \frac{\text{Working Capital}}{\text{Total Assets}}$

Working Capital = Current Assets – Current Liabilities

Current Assets	₹	Current Liabilities	₹
Inventory	2,00,000	Sundry creditors	2,00,000
Sundry Debtors	1,10,000	Provision for tax	1,00,000
Loans & Advances	40,000		
Cash at Bank	50,000		
	4,00,000		3,00,000

Hence, Working Capital = ₹ (4,00,000 – 3,00,000) = ₹ 1,00,000.

Total Assets = Fixed Assets + Current Assets = ₹ (1,50,000 + 4,00,000) = ₹ 5,50,000

$X_1 = \frac{₹1,00,000}{₹5,50,000} = 0.18 \times 100 = 18\%.$

$X_2 = \frac{\text{Retained Earnings}}{\text{Total Assets}} = \frac{₹50,000}{₹5,50,000} = 0.09 \times 100 = 9\%.$

$X_3 = \frac{\text{Earnings before Interest and Tax}}{\text{Total Assets}} = \frac{\text{Sales - Operating Expenses}}{\text{Total Assets}}$

$= \frac{₹(10,00,000 - 8,00,000)}{₹5,50,000} = \frac{₹2,00,000}{₹5,00,000} = 0.36 = 36\%.$

$X_4 = \frac{\text{Market Value of Equity}}{\text{Book Value of Total Debts}} = \frac{10,000 \text{ Shares} \times ₹8}{₹1,00,000 + 3,00,000} = \frac{₹80,000}{₹4,00,000} = 0.20 = 20\%.$

$X_5 = \frac{\text{Sales}}{\text{Total Assets}} = \frac{₹10,00,000}{₹5,50,000} = 1.82 \text{ times}.$

$Z = (0.012 \times 18) + (0.014 \times 9) + (0.033 \times 36) + (0.006 \times 20) + (0.999 + 1.82) = 3.468$

Note: (1) It is assumed that depreciation remains included in operating expenses.

Altman observed in his study that all sample firms considered by him with Z score above 2.99 were non-bankrupt. Accordingly, the firm in question with Z score 3.468 may be predicted as non-sick.

(2) It should be noted that the values of the variables i.e., X_1, X_2, X_3, and X_4 to be multiplied with their respective discriminate coefficients will be in absolute number and not in percent.

10. (a) Describe about the Dr. L.C. Gupta's Sickness Prediction Model under the corporate failure.

(b) Discuss the Total Loss Distribution [6+4]

Answer of 10:

(a) 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 numbers of misclassifications are 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.

(a) (Earnings before Interest and Taxes) ÷ Sales

and

(b) (Operating cash flow) ÷ Sales

[Note: Operating cash flow = profit after tax + depreciation]

(b) 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 Poisson.