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 <u>any two questions from</u> Section A (out of three questions – questions Nos. 2 to 4). From Section B, Answer <u>any two questions</u> (i.e. out of Question nos. 5 to 7). From Section C, Answer <u>any two questions</u> (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:
Over the past ten years, Walmart has become the world's largest and arguably most powerful retailer with the highest sales per square foot, inventory turnover, and operating profit of any discount retailer. Walmart owes its transition from regional retailer to global powerhouse largely to changes in and effective management of its supply chain.

Walmart began with the goal to provide customers with the goods they wanted when and where they wanted them. Walmart then focused on developing cost structures that allowed it to offer low everyday pricing. The key to achieving this goal was to make the way the company replenishes inventory the centerpiece of its strategy, which relied on a logistics technique known as cross docking. Using cross docking, products are routed from suppliers to Walmart's warehouses, where they are then shipped to stores without sitting for long periods of time in inventory. This strategy reduced Walmart's costs significantly and they passed those savings on to their customers with highly competitive pricing. Walmart then concentrated on developing a more highly structured and advanced supply chain management strategy to exploit and enhance this competitive advantage.

The main elements of a supply chain include purchasing, operations, distribution, and integration. The supply chain begins with purchasing. Purchasing managers or buyers are typically responsible for determining which products their company will sell, sourcing product suppliers and vendors, and procuring products from vendors at prices and terms that meets profitability goals.

Supply chain operations focus on demand planning, forecasting, and inventory management. Forecasts estimate customer demand for a particular product during a specific period of time based on historical data, external drivers such as upcoming sales and promotions, and any changes in trends or competition. Using demand planning to develop accurate forecasts is critical to effective inventory management. Forecasts are compared to inventory levels to ensure that distribution centers have enough, but not too much, inventory to supply stores with a sufficient amount of product to meet demand. This allows companies to reduce inventory carrying costs while still meeting customer needs.

Moving the product from warehouses or manufacturing plants to stores and ultimately to customers is the distribution function of the supply chain.

Supply chain integration refers to the practice of developing a collaborative workflow among all departments and components involved in the supply chain to maximize efficiencies and build a lean supply chain.

Walmart has been able to assume market leadership position primarily due to its efficient integration of suppliers, manufacturing, warehousing, and distribution to stores. Its supply chain strategy has four key components: vendor partnerships, cross docking and distribution management, technology, and integration.

Walmart's supply chain begins with strategic sourcing to find products at the best price from suppliers who are in a position to ensure they can meet demand. Walmart establishes strategic partnerships with most of their vendors, offering them the potential for long-term and high volume purchases in exchange for the lowest possible prices.

Suppliers then ship product to Walmart's distribution centers where the product is cross docked and then delivered to Walmart stores. Cross docking, distribution management, and transportation management keep inventory and transportation costs down, reducing transportation time and eliminating inefficiencies.

Technology plays a key role in Walmart's supply chain, serving as the foundation of their supply chain. Walmart has the largest information technology infrastructure of any private company in the world. Its state-of-the-art technology and network design allow Walmart to accurately forecast demand, track and predict inventory levels, create highly efficient transportation routes, and manage customer relationships and service response logistics.

Required:
(a) Mention the objectives of supply chain Management.
(b) Explain the importance of Supply Chain Management.
(c) Discuss the benefits getting after the adoption of Supply Chain Management by Wal Mart.
(d) Explain how Walmart's manage the Supply Chain Management.
(e) Describe the component of Supply Chain Management.

[3+3+4+5+5]

Solution:
(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, and 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) Wal-Mart's supply chain management strategy has provided the company with several sustainable competitive advantages, including lower product costs, reduced inventory carrying costs, improved in-store variety and selection, and highly competitive pricing for the consumer. This strategy has helped Walmart become a dominant force in a competitive global market. As technology evolves, Walmart continues to focus on innovative processes and systems to improve its supply chain and achieve greater efficiency.

(d) Walmart has been able to assume market leadership position primarily due to its efficient integration of suppliers, manufacturing, warehousing, and distribution to stores. Its supply chain strategy has four key components: vendor partnerships, cross docking and distribution management, technology, and integration.

Walmart's supply chain begins with strategic sourcing to find products at the best price from suppliers who are in a position to ensure they can meet demand. Walmart establishes strategic partnerships with most of their vendors, offering them the potential for long-term and high volume purchases in exchange for the lowest possible prices.

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(e) There are five basic components of Supply Chain Management. These are showing in the diagram:
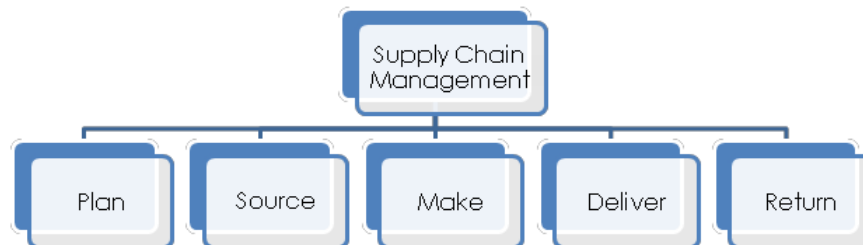
- **Plan:** This is the strategic portion of SCM. You need a strategy for managing all the resources that go toward the meeting customer demand for your product and services.

- **Source:** Choose the suppliers that will deliver the goods and services you need to create your product. Develop a set of pricing, delivery and payment processes with suppliers and create metrics for monitoring and improving the relationships.

- **Make:** This is the manufacturing step. Schedule the activities necessary for production, testing, packaging and preparation for delivery.

- **Deliver:** This is the part that many insiders refer to as logistics. Coordinate the receipt of orders from customers, develop a network of warehouses, pick carriers to get products to customers and set up an invoicing system to receive payments.

- **Return:** The problem part of the supply chain. Create a network for receiving defective and excess products back from customers and supporting customers who have problems with delivered products.

2. (a) Reduce the following two-person zero-sum game to 2 x 2 order, and obtain the optimal strategies for each player and the value of the game

		Player B			
		B₁	**B₂**	**B₃**	**B₄**
	A₁	3	2	4	0
	A₂	3	4	2	4
Player A	**A₃**	4	2	4	0
	A₄	0	4	0	8

(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]

Solution:

(a) We observe that all entries in the third row of the given matrix are greater than, or equal to, the corresponding entries in the first row. Thus the first row is dominated by the third row and as such can be deleted. The deletion of the first row leads to the following matrix.

	B₁	B₂	B₃	B₄
A₂	3	4	2	4
A₃	4	2	4	0
A₄	0	4	0	8

Next, all elements of the first column are at least equal to their counterparts in the third column. We can, thus, delete the first column to get the following matrix:

	B₂	B₃	B₄
A₂	4	2	4
A₃	2	4	0
A₄	4	0	8

We notice now that the first column is dominated by a convex linear combination of the second and the third columns because

$$4 > \frac{1}{2}(2) + \frac{1}{2}(4); \quad 2 = \frac{1}{2}(4) + \frac{1}{2}(0); \text{ and } 4 = \frac{1}{2}(0) + \frac{1}{2}(8)$$

Its deletion results in the following:

	B₃	B₄
A₂	2	4
A₃	4	0
A₄	0	8

Similarly, the first row is equated to the convex linear combination of the other two rows as shown.

$$2 = \frac{1}{2}(4) + \frac{1}{2}(o); \text{ and } 4 = \frac{1}{2}(0) + \frac{1}{2}(8)$$

Hence, we deleted the first row to get the following 2 x 2 matrix which can be solved analytically.

	B_3	B_4
A_3	4	0
A_4	0	8

For this game,

$$x = \frac{8 - 0}{(4 + 8) - (0 + 0)} = \frac{8}{12} = \frac{2}{3}; \quad y = \frac{8 - 0}{(4 + 8) - (0 + 0)} = \frac{8}{12} = \frac{2}{3}; \quad \text{and } v = \frac{4 \times 8 - 0 \times 0}{(4 + 8) - (0 + 0)} = \frac{32}{12} = \frac{8}{3}.$$

Thus, the optimal strategy for A is (0, 0, 2/3, 1/3), for B it is (0, 0, 2/3, 1/3) and the game value v = 8/3.

(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) HP Ltd manufactures two parts 'A' and 'B' for Computer Industry.
   • A: Annual Production and Sales of 1,00,000 units at a Selling Price of ₹100.05 per unit.
   • B: Annual Production and Sales of 50,000 units at a Selling Price of ₹150 per unit.

Direct and Indirect Costs incurred on these two parts are as follows - (₹ in thousands)

Particulars	A	B	Total
Direct Material Cost (Variable)	4,200	3,000	7,200
Labour Cost (Variable)	1,500	1,000	2,500
Direct Machining Costs (See Note)	700	550	1,250
Indirect Costs:			
Machine Set Up Cost			462
Testing Cost			2,375
Engineering Cost			2,250
Total			16,037

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

Additional information is as follows -

Particulars	A	B
Production Batch Size	1,000 units	500 units
Set up time per batch	30 hours	36 hours
Testing time per unit	5 hours	9 hours
Engineering Cost incurred on each product	₹8,40,000	₹14,10,000

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

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

Required:

(i) Company management identifies that cost driver for Machine Set-Up Costs is 'set up hours used in batch setting' and for Testing Costs is 'testing time'. Engineering Costs are assigned to products by special study. Calculate the full cost per unit for 'A' and 'B' using Activity-Based Costing.

(ii) What is the Mark-up on full cost per unit of A?

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

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

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

(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+1+1+3+2)+3+3+4]

Solution:

(a)

(i)   **Computation of Quantities of Cost Drivers**

Particulars	A	B	Total
a. Quantity	1,00,000 units	50,000 units	
b. Batch Size	1,000 units	500 units	
c. Number of Batches (a ÷ b)	100 batches	100 batches	
d. Set Up Time per batch	30 hours	36 hours	
e. Total Set Up Time for Production (c x d)	3,000 hours	3,600 hours	6,600 hours
f. Testing Time per unit	5 hours	9 hours	
g. Total Testing Time for Production (a x f)	5,00,000 hours	4,50,000	9,50,000 hours

Computation of ABC Recovery Rates

Activity	Activity Cost Pool	Cost Driver	Cost Driver Quantity	ABC Rate

| Machine Set Up | ₹ 4,62,000 | Set Up Hours | 6,600 Set Up Hours | ₹70 per hour. |
| Testing | ₹23,75,000 | Testing Hours | 9,50,000 Testing Hours | ₹2.50 per hour. |

Note: Engineering Costs are assigned by special study. Hence ABC Rate is not calculated.

Computation of Cost per unit using ABC System

Particulars	A	B
Direct Costs:		
Direct Materials	42,00,000 ÷1,00,000 = 42.00	30,00,000 ÷ 50,000 = 60.00
Direct Labour	15,00,000 ÷1,00,000 = 15.00	10,00,000 ÷50,000 = 20.00
Direct Machining	7,00,000 ÷1,00,000= 7.00	5,50,000÷50,000= 11.00
Sub Total Direct Costs	64.00	91.00
Indirect Costs:		
Machine Set Up	(₹70 x 30 hrs) ÷1,000 uts =2.10	(₹70 x 36 hrs) ÷ 500 uts = 5.04
Testing	(₹2.5 ph x 5 hours) = 12.50	(₹2.5 ph x 9 hours) = 22.50
Engineering	8,40,000÷1,00,000= 8.40	14,10,000÷50,000 = 28.20
Sub Total Indirect Costs	23.00	55.74
Total Costs	87.00	146.74

(ii) Markup (or) Profit per unit of A = Selling Price - Full Cost = ₹ 100.05 - ₹87.00 = ₹13.05 p.u.
Percentage of Markup to Full Cost = ₹13.05 ÷ ₹87 = 15% on Cost.

(iii) Computation of Target cost for New Design of A

New Selling Price (given)	₹86.25
Less: Target Profit at 15% on Cost i.e. 15/115 on SP = 86.25 x 15/115	₹11.25
Target Cost for New Design of A	₹75.00

(iv) Computation of Cost per unit of New Design A

Particulars		A
Direct Costs: Direct Materials Direct Labour		42.00-5.00 = 37.00
Direct Machining (dedicated machine, hence time saved is		15.00-2.00 =13.00
Sub Total Direct Costs		57.00
Indirect Costs: Machine Set Up	(₹70 x 28 hours) ÷1,000 units	1.96
Testing	(₹2.5 ph x 4 hours)	10.00
Sub Total Indirect Costs		20.36
Total Estimated Costs of New Design A		77.36

Target Cost is ₹75.00 only. Hence, the new design will not achieve the cost reduction target.

Note: It is assumed that output of A will remain at 1,00,000 units, inspite of the reduction in machine time. To maintain 15% profit margin, probable SP of New Design A will be ₹77.36 + 15% = ₹88.96.

(v) Possible management actions for new design
- Value Engineering and Value Analysis to reduce the Direct Material Costs.
- Time and Motion Study in order to redefine the Direct Labour time and related costs.
- Exploring possibility of cost reduction in costs of Direct Machining.
- Identifying non-value added activities and eliminating them in order to reduce Overheads.

- Analysis of effect of sale of New Design A on sale of B.
- Analyses of sensitivity of sale quantity of New Design A to price change from ₹86.25 to ₹88.96.

Note: Student may answer any 4 alternatives of the above

(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 = $\dfrac{x^3}{3} - 5x^2 + 28x + 10$, where C is total cost and 'x' is the output. A tax @ ₹2 per unit of output is imposed and the producer adds it to his cost. If the demand function is given by P = 2530 - 5x, where 'P' is the price per unit of output, Find the profit maximizing output and the price at the level.

   (d) The price (P) per unit at which company can sell all that it produces is given by the function P(x) = 300 – 4x. The cost function is 500 + 28x, where 'x' is the number of units, find x, so that profit is maximum.

   (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]

Solution:
(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,   π = 4 x125 – 100 = 400

So, Break Even sales is ₹ 125 and Break even profit is ₹ 400

(c) Given (C) = $\dfrac{x^3}{3} - 5x^2 + 28x + 10 + 2x$

P = 2530 – 5x

Revenue = xp = 2530x – 5x^2

Profit = 2530x – 5x^2 + 5x^2 – 28x – 10 $- \dfrac{x^3}{3} - 2x$

= $-\dfrac{x^3}{3} - 2,502x - 10 - 2x$

For Max

$\dfrac{dp}{dx} = \dfrac{-3x^2}{3} - 2,500 = 0$

X^2 = 2,500

∴ $x = \sqrt{2,500}$ = 50

Again,

$\dfrac{d^2p}{dx^2} = -2x$

For x = 50,

$\dfrac{d^2p}{dx^2} = -2 \times 50 = -100\,which\,is\,negative$

∴ Maximum profit is at x = 50 units
Price = 2,530 – 5 x 50 = 2,280

(d)   P = 300 – 4x
R = P(x) = 300x – 4x^2
C = 500 + 28x
P = R – C
Profit = 300x – 4x^2 – 500 – 28x
= –4x^2 + 272x – 500

$\dfrac{dz}{dx}$ = – 8x + 272 = 0

– 8x = –272

X = 272/8 = 34

$\dfrac{d^2z}{dx^2}$ = –8, which is Negative

Profit is maximum at x = 34 units.

(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]**
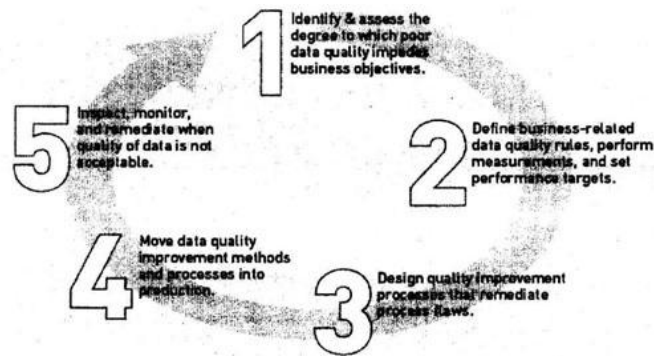
Solution:

(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]

Solution:

(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.
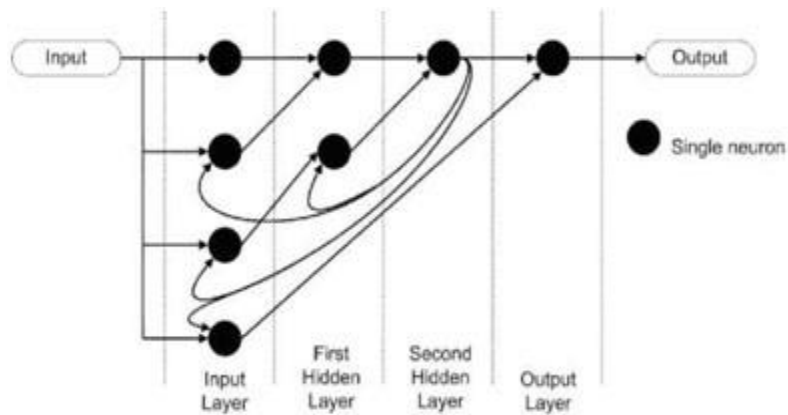
(b) Types

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:

(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. **Discuss Altman's Model and Explain the Five Z – Score Constituent Ratios.** [10]

Answer:
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:
- **Working Capital/Total Assets (WC/TA):-** a firm with negative working capital is likely to experience problems meeting its short-term obligations.
- **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.
- **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.

- **Market Value of Equity/ Total Liabilities: -** A ratio that shows, if a firm were to become insolvent, how much the company market value would declines before liabilities exceed assets.
- **Sales/Total Assets: -** A measure of how management handles competition and how efficiently the firm uses assets to generate sales.

    Based on the Multiple Discriminant 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

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.