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 <u>any two questions from Section A</u> (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]

1. Read the following case let 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.

(c) 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

(d) 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.

2. (a) Formulate the following game as a Linear Programming problem from (i) A's and (ii) B's point of view. The player A is the maximizing player here.

Strategy of Player B

		B_1	B_2	B_3
	A_1	90	80	110
Strategy of Player A	A_2	110	120	90
	A_3	120	70	80

(b) Explain any eight productivity improvement techniques. **[8+12]**

Answer of 2:

(a) Let p_1, p_2 and p_3 represent the probabilities with which A chooses strategies A_1 and A_2 respectively, while q_1, q_2 and q_3 be the probabilities in respect of B choosing strategies B_1, B_2 and B_3 such that

$p_1 + p_2 + p_3 = 1$ and $q_1 + q_2 + q_3 = 1$.

If the value of the game is v, then for player A, we must have

$90p_1 + 110 p_2 + 120 p_3 \geq v$, $80p_1 + 120 P_2 + 70 p_3 \geq v$, $110 p_1 + 90 p_2 + 80 p_3 \geq v$ and for player B, we shall have

$90q_1 + 80q_2 + 110 q_3 \leq v$, $110 q_1 + 120 q_2 + 90 q_3 \leq v$, $120 q_1 + 70 q_2 + 80 q_3 \leq v$

Let X_i be the probability that Player A would play ith strategy. If u be the value of the game, we define $x_i = p_i/u$, (i = 1, 2, 3). Similarly, let y_j be the probability that jth strategy would be played by Player B. If v be the game value, we define $y_j = q_j/v$, (j = 1, 2, 3). Accordingly, the problem is stated below.

From A's point of view:

Minimize $\dfrac{1}{u} = x_1 + x_2 + x_3$

Subject to the constraints

$90 x_1 + 110 x_2 + 120 x_3 \geq 1$
$80 x_1 + 120 x_2 + 70 x_3 \geq 1$
$110 x_1 + 90 x_2 + 80 x_3 \geq 1$
$x_1, x_2, x_3 \geq 0$

For B's point of view:

Maximize $\dfrac{1}{v} = y_1 + y_2 + y_3$

Subject to the constraints

$90 y_1 + 80 y_2 + 110 y_3 \leq 1$
$110 y_1 + 120 y_2 + 90 y_3 \leq 1$
$120 y_1 + 70 y_2 + 80 y_3 \leq 1$
$y_1, y_2, y_3 \geq 0$

(b) Productivity improvement techniques are explained as follows:

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

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

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

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

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

(vi) **Job Enlargement:** Job Enlargement is a horizontal expansion of a job. It is done to make jobs more interesting and satisfying. It involves increasing the variety of duties. For e.g. a typist may be given the job of accounts writing in addition to the typing work. This technique is used for lower level jobs.

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

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

3 (a) A company is planning to market a new model of a doll. Rather than setting the selling price of the doll based only on production cost estimation management polls the retailers of the doll to see how many dolls they will buy for various prices. From this survey, it is determined at the unit demand function (the relationship between the amount 'x' each retailer would buy and the price he would pay) is x = 30,000 – 1500P. The fixed cost of the production of the dolls are found to be ₹ 28,000 and cost of Material & labour to produce each doll is estimated to be ₹ 8 per unit. What price should the company charge retailer in order to obtain a maximum profit? Also find the maximum profit.

(b) Describe the role of the Management Accountant of Competitive Intelligence.

(c) A Company has sales of 1,00,000 units at a price of ₹ 200.00 per unit and profit of ₹ 40.00 Lakhs in the current year. Due to stiff competition, the Company has to reduce its price of product next year 5% to achieve same volume target of sales. The cost structure and profit for the current year is given as below:

Particulars	(₹ Lakhs)
Direct Material	60.00
Direct Wages	45.00
Variable Factory Overheads	20.00
Fixed Overheads including Sales & Admin Expenses	35.00
Total Cost	160.00

To achieve the Target Cost to maintain the same profit, the Company is evaluating the proposal to reduce Labour Cost and Fixed Factory Overheads. A Vendor supplying the Machine suitable for the Company's operations has offered an advanced technology Semi-Automatic Machine of ₹ 20 Lakhs as replacement of Old Machine worth ₹ 5.0 Lakhs. The Vendor is agreeable to take back the Old Machine at ₹ 2.70 Lakhs only. The

Company's policy is to charge depreciation at 10% on WDV. The Maintenance Charge of the Existing Machine is ₹ 1.20 Lakhs per annum whereas there will be warranty of services free of cost for the New Machine first two years. There are ten (10) Supervisors whose Salary is ₹ 1.50 Lakhs per annum. The New Machine having Conveyor Belt is expected to help in cost cutting measures in the following ways –
- Improve Productivity of workers by 20%
- Cut-down Material Wastage by 1%
- Elimination of services of Supervisors because of automatic facilities of the machine
- Saving in Packaging Cost by ₹ 1.5 Lakhs.

    Assuming Cost of Capital to be 15%, calculate how many Supervisors should be removed from the production activities to achieve the Target Cost.

(d) Mention the objectives of Customer Relationship Management.   **[5+6+5+4]**

Answer of 3:

(a) $X = 30,000 - 1,500P$

  $x - 30,000 = -1,500P$

  $\therefore P = \dfrac{30,000 - x}{1,500}$

  Revenue $= \dfrac{30,000x - x^2}{1,500}$

  $C = 8x + 28,000$

  Profit (p) $= \dfrac{30,000x - x^2}{1,500} - 8x - 28,000$

  $\dfrac{dp}{dx} = 1/1,500 \,(30,000 - 2x) - 8 = 0$

  or, $30,000 - 2x - 12,000 = 0$
  or, $-2x = -18,000$
  or, $x = 18,000/2 = 9,000$

  or, $\dfrac{d^2p}{dx^2} = -2$, which is Negative

  Profit $= \dfrac{30,000 \times 9,000 - 9,000^2}{1,500} - 72,000 - 28,000$

    $= 26,000$

(b) Competitive intelligence is a process of gathering data, creating information and making decisions. Management Accountants are trained to gather data, assimilate data into information and make decisions based upon information, frequently with their management counterparts.

Competitive intelligence may also be viewed as a competitiveness audit, a concept that Management Accountants are familiar with. Management Accountants' training and experience make them well- suited to the requirements of the competitive intelligence process.

Management Accountants may be actively involved in introducing a competitive intelligence process in several ways:
- Identifying the need for a new or improved competitive intelligence process;
- Educating top management and other senior managers about that need;
- Developing a plan along with cross-functional team members for designing, developing and implementing the new, improved competitive intelligence practice, including its underlying architectures;
- Identifying the appropriate tools and techniques for conducting competitor analysis;
- Providing financial input, analysis and expertise to the competitive intelligence effort;

- Contributing to and using competitive intelligence in target costing;
- Ensuring that the competitive intelligence efforts are tied to the firm's goals, strategies, objectives and internal processes, as appropriate; and,
- Continually assessing the new, improved competitive intelligence process and its implications for the organization and continually improving the process.

(c) For the same quantity, Sales Value will reduce by 5% of (1,00,000 units x ₹ 200.00) = ₹ 10.00 lakhs. For maintaining the same amount of profit, cost also has to be reduced by ₹ 10.00 Lakhs, which can be achieved as under -

Particulars	₹ Lakhs
Savings: Reduction in Wages (**Note:** Due to higher Labour Productivity, Wages will be $\frac{45}{1.20}$ = ₹ 37.50 Lakhs)	7.50
Elimination of wastage of Materials = 1% of ₹ 60 Lakhs	0.60
Savings in Packaging Cost (given)	1.50
Saving in Maintenance Cost (given)	1.20
Sub-Total Savings (A)	10.80
Costs: Loss in Disposal of Old Machine (₹ 5 Lakhs – ₹ 2.70 Lakhs)	2.30
Difference in Depreciation (₹ 20 Lakhs – ₹ 5 Lakhs) x 10%	1.50
Cost of Capital Investment ₹ 20 Lakhs x 15%	3.00
Sub-Total Costs (B)	6.80
Effective Cost Reduction before considering removal of Supervisors (A-B)	4.00
Additional Reduction required for meeting Target Cost, by removing Supervisors = (₹ 10 Lakhs – ₹ 4 Lakhs)	6.00

Hence, number of Supervisors to be removed = $\dfrac{₹\,6\,Lakhs}{₹\,1.50\,Lakhs\,per\,Supervisor}$ = 4 Supervisors.

(d) Objectives for using CRM applications
Objectives of using CRM Applications, defined in the following line:
- To support the customer services
- To increase the effectiveness of direct sales force.
- To support of business to business activities.
- To support of business to consumer activities.
- To manage the call center.
- To operate the In- bound call centre.
- To operate the Out - bound call centre.
- To operate the Full automated(i.e. no CRM involvement, "lights out")

4. **(a) The production function of a commodity is given by: $Q = 40x + 3x^2 - \dfrac{x^3}{3}$**

   Where q is the total output and x is the unit of input.
   (i) Find the number of units of input required to give maximum output.
   (ii) Find the maximum value of marginal product.
   (iii) Verify that when the average product is maximum, it is equal to marginal product.

   (b) Write a note on Contractual Terms in the context of Interaction of Transfer pricing and Taxation.

   (c) Amit Ltd provides the following details on its new product.
   Years 1 and 2: R & D Costs: ₹ 2,40,000, Design Costs ₹ 1,60,000 Years 3 to 6: Other Functional Costs:

Function	One-Time Costs	Costs per unit
Production	₹ 1,00,000	₹ 25
Marketing	₹ 70,000	₹ 24
Distribution	₹ 50,000	₹ 16
Customer Service	₹ 80,000	₹ 30

The sale quantities during the Product Life Cycle at various Selling Prices are

Selling Price per unit (₹)	400	480	600
Sale Quantity in units	5,000	4,000	2,500

Ignoring time value of money, compute the Net Incomes generated over the Product Life Cycle at various prices. Which price should the Company select?

(d) Describe the role of Demand in Pricing Decisions. [6+4+6+4]

Answer of 4:

(a) (i) $\frac{dQ}{dx}$ = 40 + 6x – x². For maximum or minimum, we have 40 + 6x - x² = 0

or, (x - 10) (x + 4) = 0; or, x = 10, - 4.

Again, $\frac{d^2Q}{dx^2}$ = 6 - 2x for x = 10, $\frac{d^2Q}{dx^2}$ = 6 – 2 x 10 = 6 - 20 = -14 < 0, max.

So, for input of 10 units, output is maximum.

(ii) Marginal product (MP) = $\frac{dQ}{dx}$ = 40 + 6x – x².

Now, $\frac{d(MP)}{dx}$ = 6-2x. For max. or min. 6 - 2x = 0, x = 3.

Again, $\frac{d^2(MP)}{dx^2}$ = -2 < 0, max.

So, maximum value of marginal product = 40 + 6x3 - 32 = 40+18-9 = 49

(iii) Average product (AP) = $\frac{Q}{x}$ = $\frac{40x + 3x^2 - \frac{x^3}{3}}{x}$ = $40 + 3x - \frac{x^2}{3}$

For max. or min., $\frac{d(AP)}{dx^2}$ = $\frac{-2}{3}$ < 0, max.

So, maximum value of AP = $40 + 3 \times \frac{9}{2} - \frac{1}{3}\left(\frac{9}{2}\right)^2$ = 46.75

Again, MP = (for x = $\frac{9}{2}$) = $40 + \frac{6 \times 9}{2} - \left(\frac{9}{2}\right)^2$ = 46.75

(b) Contractual terms

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

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

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

(c)

Income Statement

Particulars	Option I	Option II	Option III
1. Life Cycle Sales Quantity	5,000 units	4,000 units	2,500 units
2. Life Cycle Selling Price p.u.	₹400	₹480	₹600
3. Life Cycle Sales Revenue (1x2)	₹ 20,00,000	₹ 19,20,000	₹ 15,00,000
4. Life Cycle Functional Costs			
(a) Research and Development	₹ 2,40,000	₹ 2,40,000	₹ 2,40,000
(b) Design	₹ 1,60,000	₹ 1,60,000	₹ 1,60,000
(c) Production One Time Variable	₹ 1,00,000 5000 x ₹ 25 =₹1,25,000	₹ 1,00,000 4000 x ₹25=₹1,00,000	₹ 1,00,000 2500 x ₹25=₹62,500
(d) Marketing One Time Variable	₹ 70,000 5000 x ₹ 24 =₹1,20,000	₹ 70,000 4000 x ₹ 24 = ₹96,000	₹ 70,000 2500 x ₹24=₹60,000
(e) Distribution One Time Variable	₹ 50,000 5000 x ₹ 16 = ₹ 80,000	₹ 50,000 4000 x ₹ 16 = ₹ 64,000	₹ 50,000 2500 x ₹ 16 = ₹ 40,000
(f) Customer Service One Time Variable	₹ 80,000 5000 x ₹ 30 =₹1,50,000	₹ 80,000 4000 x ₹30=₹1,20,000	₹ 80,000 2500 x ₹30=₹75,000
Life Cycle Total Costs	₹ 11,75,000	₹ 10,80,000	₹ 9,37,500
5. Life Cycle Net Income	₹ 8,25,000	₹ 8,40,000	₹ 5,62,500

Conclusion: The Company may select Price of ₹ 480 to maximize Profits. Assumed that R&D Costs and Design Costs represent Total Costs incurred in 2 Years.

(d) The Role of Demand in Pricing Decisions

How a business firm's buyers respond to a change in price is an important consideration, for the eventual effect on sales volume and revenue is determined by the degree of buyer's demand sensitivity to price changes. However, price –setters the following four points:

(i) **Market Vs Firm Elasticity:**

Price elasticity of demand is a measure of the degree to which buyers are sensitive to price changes. In any market characterized by several functionally substitutable products, there are actually two demand schedules: 1) demand for the general product (primary demand) and 2) demand for the firm's specific offering (secondary demand). In general, secondary demand is found to be more price elastic. But a seller may sometimes mistake relatively inelastic market or primary demand as elastic secondary demand.

(ii) **Demand for buyer's Output:**

The Market for buyer's products may actually be price-elastic. So a reduction in price by a firm would raise demand for its product. Hence, manufacturers selling to such buyers, and whose product represents a significant portion of these buyers product costs may curtail sales opportunities by eliminating discounts or low margin products.

(iii) **Likelihood of Competitive Entry:**

K.B. Monroe has pointed out that "an emphasis on high-price strategies may encourage the entry of competitors when entry barriers are minor and when demand

is actually price-elastic. Moreover, high prices or rapidly increasing prices may force buyers to reconsider their need and, perhaps, actively seek out competitive substitutes.

(iv) **Demand Consequences of a Product Line:**
Most firms sell a wide variety of products requiring a variety of different marketing strategies. Within a product line there are usually some products that are functional substitutes for each other and some products that are functionally complementary. For example, a photographic product line includes such items like cameras, films, flash bulbs, projectors, screens and other accessories. Because of the demand interrelationships and because there are usually several price-market targets, the product line pricing problem throws a major challenge before the marketing executives.

Section – B
[Answer any 2 questions from this section]

5. (a) State the problems are addressed by Supply Chain Management.
   (b) Describe about the Recurrent Artificial Neural Network. [6+4]

Answer of 5:

(a) Supply Chain Management must address the following problems:
- **Distribution Network Configuration**: Number, location and network missions of suppliers, production facilities, distribution centers, warehouses, cross-docks and customers.
- **Distribution Strategy:** Questions of operating control (centralized, decentralized or shared); delivery scheme, e.g., direct shipment, pool point shipping, cross docking, direct store delivery (DSD), closed loop shipping; mode of transportation, e.g., motor carrier, including truckload, Less than truckload (LTL), parcel; railroad; intermodal transport, including trailer on flatcar (TOFC) and container on flatcar (COFC); ocean freight; airfreight; replenishment strategy (e.g., pull, push or hybrid); and transportation control (e.g., owner-operated, private carrier, common carrier, contract carrier, or third-party logistics (3PL)).
- **Trade-Offs in Logistical Activities**: The above activities must be well coordinated in order to achieve the lowest total logistics cost. Trade-offs may increase the total cost if only one of the activities is optimized. For example, full truckload (FTL) rates are more economical on a cost per pallet basis than LTL shipments. If, however, a full truckload of a product is ordered to reduce transportation costs, there will be an increase in inventory holding costs which may increase total logistics costs. It is therefore imperative to take a systems approach when planning logistical activities. These trades-offs are key to developing the most efficient and effective Logistics and SCM strategy.
- **Information**: Integration of processes through the supply chain to share valuable information, including demand signals, forecasts, inventory, transportation, potential collaboration, etc.
- **Inventory Management**: Quantity and location of inventory, including raw materials, work-in-process (WIP) and finished goods.
- **Cash-Flow**: Arranging the payment terms and methodologies for exchanging funds across entities within the supply chain.

(b) Recurrent Artificial Neural Networks
Artificial neural network with the recurrent topology is called Recurrent Artificial neural network. It is similar to feed-forward neural network with no limitations regarding back-loops. In these cases information is no longer transmitted only in one direction but it is also transmitted backwards. This creates an internal state of the network which allows it to exhibit dynamic temporal behaviour. Recurrent artificial neural networks can use their internal memory to process any sequence of inputs. The following figure shows

small Fully Recurrent artificial neural network and complexity of its artificial neuron interconnections. The most basic topology of recurrent artificial neural network is fully recurrent artificial network where every basic building block (artificial neuron) is directly connected to every other basic building block in all direction. Other recurrent artificial neural networks such as Hopfield, Elman, Jordan, bi-directional and other networks are just special cases of recurrent artificial neural networks.

6. (a) **"Government can, however, play an important role in examining the economic and social impact of ecommerce technologies and in promoting understanding and application of these technologies throughout Indian industries and communities." – Describe any 5 role of the government.**

   (b) **Explain about the Fuzzy sets in HR Management.**   **[5+5]**

   Answer of 6:
   (a) Government can, however, play an important role in examining the economic and social impact of ecommerce technologies and in promoting understanding and application of these technologies throughout Indian industries and communities.
       (i)   Facilitating market access and business opportunities, especially for small, medium, and micro enterprises (SMMEs), on a national and global scale.
       (ii) Providing educational and skills development resources.
       (iii) Supporting the rapid deployment of necessary infrastructure.
       (iv) Facilitating the development of MPCCs as vibrant seeding points for community knowledge and wealth creation, above and beyond the provision of the latest ICTs.
       (v) Developing "model use" programmes for the dissemination of government information and services using e-commerce platforms, e.g., for electronic tender processes.

   (b) Fuzzy sets are sets whose elements have degrees of membership. Fuzzy sets were introduced by Lotfi A. Zadeh and Dieter Klaua in 1965 as an extension of the classical notion of set. At the same time, Salii (1965) defined a more general kind of structures called L-relations, which were studied by him in an abstract algebraic context.

   Fuzzy Sets in HR Management
   This project specializes in the implementation of the Microsoft Dynamics NAV information system. The evaluation of employees is based on multiple criteria evaluations. The criteria are derived from typical competencies of the employees. A competency model has been created for any given role with different normalized weights assigned to various competencies. The evaluation proceeds in the following manner: Firstly, the appointed evaluators fill in a questionnaire indicating to what extent, in their view, the tested employee meets his/her competencies. These evaluations are expressed using fuzzy scales. Normalized weights assigned to the evaluators of any given employee are set based on the intensity of cooperation between the employee and his/her evaluators. The level of fulfillment of each competency by the given employee is calculated as a weighted average of the fuzzy evaluations, conducted by each of his/her evaluators. Then, the overall fulfillment level of the employee's working role, again as a weighted average of fuzzy numbers, is calculated according to a specified model. This produces an overall evaluation of the employee. The evaluation process is followed by an interview where the employee is informed of his/her evaluation results, the employees gaps are discussed, and possibilities for improvement are proposed.

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

Section C
[Answer any 2 questions from this section]

8. (a) Describe the Performance-Related measures in the context of Corporate Risk Management.
   (b) Explain about the Exchange Rate Risk and Liquidity Risk. [6+(2+2)]

Answer of 8:

(a) Performance - Related measures in the context of Corporate Risk Management are those which concentrate on the mid-region of the probability distribution, i.e., the region near the 'mean' and are relevant for determination of the volatility around expected results.

The following are some of the Performance - related measures in the context of Corporate Risk Management.

   i. **Return on Equity -** Net Income divided by Net Worth.
   ii. **Operating Earnings -** Net Income from continuing operations, excluding realized investment gains.
   iii. **Earnings before Interest -** Dividends, Taxes, Depreciation and Amortization (EBITDA).A form of cash flow measure for evaluating the operating performance of companies with high levels of debt.
   iv. **Cash Flow Return on Investment (CFROI) -** EBITDA divided by tangible assets.
   v. **Weighted Average Cost of Capital (WACC) -** The sum of the required market returns of each component of corporate capitalization, weighted by that component's share of the total capitalization.
   vi. **Economic Value Added (EVA) -** A corporate performance measure that stresses the ability to achieve above the firm's cost of capital.

(b) **Exchange Rate Risk:**

Exchange Rate Risk Management through asset-liability management: At a particular exchange rate assets and liabilities of a financial institution match exactly. As the exchange rate fluctuates this balance gets disturbed. A simple solution to correct this risk is to match assets and liabilities of the same currency. Many financial institutions do not have foreign exchange exposure as all their assets and liabilities are in rupee currency. The risk of foreign exchange borrowings of these institutions are passed on to the lenders through dollar denominator loans. The uncovered loans are hedged at the time of contracting them through forward covers for the entire amount.

Liquidity Risk:

It is that portion of an asset's total variability of return which results from price discounts given or sales commissions paid in order to sell the asset without delay. It is a situation wherein it may not be possible to sell the asset. Assets are disposed off at great inconvenience and cost in terms of money and time. Any asset that can be bought or sold quickly is said to be liquid. Failure to realize with minimum discount to its value of an asset is called liquidity risk.

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,

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

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

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

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

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

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

$= \dfrac{₹(1,00,000 - 8,00,000)}{₹5,50,000} = \dfrac{₹2,00,000}{₹5,00,000} = 0.36 = 36\%.$

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

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

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

Note: 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.

Note: 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 discriminant coefficients will be in absolute number and not in percent.

10. Discuss about the Probability of Ruin and Risk Pooling. [6+4]

Answer of 10:
Probability of Ruin:
Ruin theory also known as collective risk theory, was actually developed by the insurance industry for studying the insurers vulnerability to insolvency using mathematical modeling. It is based on the derivation of many ruin-related measures and quantities and specifically includes the probability of ultimate ruin. This can be also related to the sphere of applied probability as the techniques used in the ruin theory as fundamentally arising out of stochastic processes. Many problems in ruin theory relate to real-life actuarial studies but the mathematical aspects of ruin theory have really been of interest to actuarial scientists and other business research people.

Normally an insurers' surplus has been computed as the net of two opposing cash flows, namely, cash inflow of premium income collected continuously at the rate of c and the cash outflow due to a series of insurance claims that are mutually independent and identically distributed with a common distribution function P(y). The path of the series of claims is assumed to respond to a Poisson process with intensity rate • which would mean that the number of claims received N(t) at a time frame of t is controlled by a Poisson distribution with a mean λ_t. Therefore, the insurer's surplus at any time t is represented by the following-formula:

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

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

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

Risk Pooling
The concept of pooling risk is the process of identification of separate risks and put them all together in a single basket, so that the monitoring, combining, integrating or diversifying risk can be implemented.

Monitoring becomes easier when the specific agency put in charge knows that all the risks have been identified and they are being monitored according to the system drawn up to quantify the total risk through pooling and with a control figure i.e., plan the way to monitor, actually monitor and then check whether there are variations from the monitoring exercise and then act to correct the deviation. This correction act can be combining risks or integrating risks or diversifying risks.

For example, whenever a project is put up. Transit Insurance is taken for transporting the various plant and machinery from the manufacturers to the project site. The materials are then received at the site and stored until erection. Storage Insurance will cover the risk during the storage. During erection of different plant & machinery, risks due to mechanical, electrical etc., are covered through erection Insurance. The erected plant & machinery is then tested and trial runs are taken for guarantee purposes on continuous run. All these risks put together is called pooling. This single pooled policy has a risk value and premium payable and the conditions attached thereto by both the insurer and the insured to carry out those obligations are clearly spelled out in the policy documents.