

R4290

Sub. Code

25MLM1C1

M.B.A. DEGREE EXAMINATION, NOVEMBER – 2025

First Semester

Logistics and Supply Chain Management

**MANAGEMENT PRINCIPLE AND ORGANIZATIONAL
BEHAVIOUR**

(CBCS – 2025 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective questions by choosing the correct option.

1. Which of the following best describes management as a process? (CO1, K2)
 - (a) Planning, organizing, staffing, directing and controlling
 - (b) Commanding and disciplining employees only
 - (c) Supervising daily work activities alone
 - (d) Focusing only on profit generation

2. Who is regarded as the father of scientific management? (CO1, K2)
 - (a) Henri Fayol
 - (b) Elton Mayo
 - (c) F.W. Taylor
 - (d) Max Weber

3. Which one is NOT a component of planning? (CO2, K3)
- (a) Vision (b) Mission
(c) Intuition (d) Strategies
4. The process of making choices among alternatives under uncertainty is called (CO2, K3)
- (a) Delegation
(b) Decision making
(c) Coordination
(d) Forecasting
5. Which personality theory proposes that individuals acquire behaviours by observing others? (CO3, K3)
- (a) Trait theory
(b) Psychoanalytic theory
(c) Social learning theory
(d) Big Five model
6. Which motivation theory distinguishes between hygiene factors and motivators? (CO3, K3)
- (a) Expectancy theory
(b) Herzberg's Two-factor theory
(c) Goal-setting theory
(d) Equity theory

7. Transformational leadership focuses on (CO4, K2)
- (a) Task supervision only
 - (b) Inspiring and motivating followers towards vision
 - (c) Maintaining strict authority
 - (d) Negotiating rewards
8. Which of the following is NOT a common source of organizational conflict? (CO4, K2)
- (a) Scarcity of resources
 - (b) Differences in values
 - (c) Work-life balance
 - (d) Shared organizational goals
9. Which stage of group development is characterized by conflict and competition? (CO5, K2)
- (a) Forming
 - (b) Storming
 - (c) Norming
 - (d) Performing
10. Organizational culture primarily helps in (CO5, K2)
- (a) Reducing the need for managers
 - (b) Creating and sustaining shared values
 - (c) Eliminating communication needs
 - (d) Increasing financial resources

Part B

(5 × 5 = 25)

Answer **all** the following questions not more than
500 words each.

11. (a) Explain the difference between management as an art and management as a science. (CO1, K2)

Or

- (b) Discuss the importance of strategic planning in organizations. (CO1, K2)

12. (a) Describe the Big Five model of personality. (CO2, K3)

Or

- (b) Explain the concept of transformational leadership. (CO2, K3)

13. (a) Discuss the barriers to effective interpersonal communication. (CO3, K3)

Or

- (b) Explain the managerial roles as proposed by Henry Mintzberg. (CO3, K3)

14. (a) Explain the role of perception in individual behaviour. (CO4, K2)

Or

- (b) Discuss major sources of stress in the workplace. (CO4, K2)

15. (a) Explain the stages of group development. (CO5, K2)

Or

- (b) Discuss the importance of organizational culture.
(CO5, K2)

Part C

(5 × 8 = 40)

Answer **all** the following questions not more than
1000 words each.

16. (a) Critically evaluate the contributions of F.W. Taylor and Henri Fayol to management theory. (CO1, K2)

Or

- (b) Discuss globalization, diversity, and ethics as contextual forces influencing management today.
(CO1, K2)

17. (a) Explain the process of decision making under certainty, risk, and uncertainty with examples.
(CO2, K3)

Or

- (b) Explain the components of planning such as vision, mission, objectives, strategies, and policies.
(CO2, K3)

18. (a) Analyse the role of perception in individual behaviour and its managerial implications.
(CO3, K3)

Or

- (b) Evaluate Maslow's hierarchy of needs and Herzberg's Two-factor theory in motivating employees.
(CO3, K3)

19. (a) Discuss sources of power in organizations and how politics can be managed effectively. (CO4, K2)

Or

- (b) Analyse sources and types of conflict in organizations and suggest negotiation strategies. (CO4, K2)

20. (a) Examine the characteristics of effective teams and the importance of organizational culture. (CO5, K2)

Or

- (b) Discuss organizational culture and climate and explain how leaders can sustain strong culture. (CO5, K2)
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R4291

Sub. Code

25MLM1C2

M.B.A. DEGREE EXAMINATION, NOVEMBER – 2025

First Semester

Logistics and Supply Chain Management

ENVIRONMENT AND ECONOMICS FOR MANAGERS

(CBCS – 2025 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Managerial economics is best described as (CO1, K2)
 - (a) Application of economic concepts to decision-making
 - (b) Study of national income
 - (c) Study of government policies only
 - (d) Consumer psychology

2. The concept of “opportunity cost” means (CO1, K2)
 - (a) Future returns from investment
 - (b) Additional production cost
 - (c) The value of the best alternative forgone
 - (d) Average cost of production

3. The law of demand states that (CO2, K2)
- (a) Price \uparrow \rightarrow Demand \uparrow
 - (b) Price \uparrow \rightarrow Demand \downarrow
 - (c) Supply \uparrow \rightarrow Demand \downarrow
 - (d) Income \uparrow \rightarrow Demand \downarrow
4. Price elasticity of demand measures (CO2, K2)
- (a) Responsiveness of demand to changes in price
 - (b) Responsiveness of demand to changes in income
 - (c) Changes in supply due to demand
 - (d) Relation of cost and output
5. Business environment consists of (CO3, K3)
- (a) Only political factors
 - (b) Only consumer tastes
 - (c) Only organizational structure
 - (d) Internal and external forces affecting business
6. A socialist economy is characterized by (CO3, K3)
- (a) Private ownership of resources
 - (b) Profit motive
 - (c) State ownership and central planning
 - (d) No government role

7. Which is a demographic factor affecting business? (CO4, K5)
- (a) Population growth
 - (b) WTO regulations
 - (c) Import tariffs
 - (d) Exchange rate
8. Business ethics are primarily concerned with (CO4, K5)
- (a) Laws of taxation
 - (b) Morality and fairness in business
 - (c) Only maximizing shareholder wealth
 - (d) Political lobbying
9. The WTO's dispute settlement body deals with (CO5, K3)
- (a) Industrial strikes
 - (b) National budget disputes
 - (c) Currency exchange disputes
 - (d) Trade conflicts between member nations
10. Balance of Payments includes (CO5, K3)
- (a) Only exports
 - (b) Only imports
 - (c) All international trade and capital transactions
 - (d) Domestic fiscal transactions

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) What is managerial economics? Explain the nature of managerial economics. (CO1, K2)

Or

- (b) State the role of managerial economics in business decisions. (CO1, K2)

12. (a) List determinants of supply. (CO2, K2)

Or

- (b) What are the uses of elasticity of supply? (CO2, K2)

13. (a) Write a note on business environment? (CO3, K3)

Or

- (b) State the characteristics of India as a mixed economy. (CO3, K3)

14. (a) Explain population control policies. (CO4, K5)

Or

- (b) What is meant by corporate governance? (CO4, K5)

15. (a) Explain the functions of WTO. (CO5, K3)

Or

- (b) State the components of Balance of Payments. (CO5, K3)

Part C

(5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Explain time value of money in managerial economics. (CO1, K2)

Or

- (b) Critically examine the relationship between economic theory and managerial economics. (CO1, K2)

17. (a) Explain the methods of demand forecasting. (CO2, K2)

Or

- (b) Discuss the role of elasticity of demand in business strategy. (CO2, K2)

18. (a) Explain internal and external elements of business environment. (CO3, K3)

Or

- (b) Explain the significance of India as an emerging economy. (CO3, K3)

19. (a) Explain the role of demographic trends in business planning. (CO4, K5)

Or

- (b) Critically analyze the concept of social responsibility of business. (CO4, K5)

20. (a) Evaluate the role of foreign direct investment (FDI) in India's growth. (CO5, K3)

Or

- (b) Explain the role of globalization in shaping Indian industries. (CO5, K3)
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R4292

Sub. Code

25MLM1C3

M.B.A DEGREE EXAMINATION, NOVEMBER – 2025

First Semester

Logistics and Supply Chain Management

ACCOUNTING FOR MANAGERS

(CBCS – 2025 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. The accounting principle that requires business transactions to be recorded separately from the personal transactions of the owner is known as: (CO1, K2)
 - (a) Going Concern Concept
 - (b) Business Entity Concept
 - (c) Money Measurement Concept
 - (d) Duality Concept

2. Human Resource Accounting aims to (CO1, K2)
 - (a) Record the salaries paid to employees
 - (b) Measure the cost and value of people to the organization
 - (c) Ensure compliance with labor laws
 - (d) Calculate the number of employees in a firm

3. The issue of shares to existing employees at a price lower than the market price is called (CO2, K3)
- (a) Buyback of Securities
 - (b) Preferential Allotment
 - (c) Employee Stock Option (ESOP)
 - (d) Alteration of Share Capital
4. Which of the following is prepared to show the financial position of a company on a specific date? (CO2, K3)
- (a) Profit and Loss Account
 - (b) Trial Balance
 - (c) Balance Sheet
 - (d) Cash Flow Statement
5. The primary objective of preparing a Cash Flow Statement is to (CO3, K4)
- (a) Ascertain the profit or loss of a business
 - (b) Determine the financial position of the business
 - (c) Provide information about the cash inflows and outflows during a period
 - (d) Assess the inventory levels of the company
6. A high Current Ratio generally indicates (CO3, K4)
- (a) The firm is very profitable
 - (b) The firm has a large amount of debt
 - (c) The firm is struggling to meet its short-term obligations
 - (d) The firm is in a good position to meet its short-term obligations

7. Which capital budgeting technique does not consider the time value of money? (CO4, K5)
- (a) Net Present Value (NPV)
 - (b) Internal Rate of Return (IRR)
 - (c) Payback Period
 - (d) Profitability Index (PI)
8. An investor's tendency to hold on to losing stocks for too long and sell winning stocks too soon is an example of. (CO4, K5)
- (a) Herd Mentality
 - (b) Confirmation Bias
 - (c) Disposition Effect
 - (d) Anchoring Bias
9. Operating leverage helps in analyzing the relationship between. (CO5, K3)
- (a) Sales and Earnings Per Share (EPS)
 - (b) Sales and Earnings Before Interest and Tax (EBIT)
 - (c) EBIT and EPS
 - (d) Sales and Net Profit
10. The term 'Working Capital' refers to. (CO5, K3)
- (a) Capital invested in fixed assets
 - (b) The difference between current assets and current liabilities
 - (c) The total amount of shareholder funds.
 - (d) The total long-term debt of a company

Part B

(5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) Explain any five key accounting concepts that guide the preparation of financial statements. (CO1, K2)

Or

- (b) What is Inflation Accounting? Briefly explain its significance in financial reporting. (CO1, K2)

12. (a) From the following information, calculate the profit prior to incorporation: (CO2, K3)

A company was incorporated on 1st August 2024 to take over a business from 1st April 2024.

Total sales for the year ending 31st March 2025 were Rs. 3,600,000.

Sales from April to July were Rs. 1,200,000.

Gross Profit ratio was 25%.

Total indirect expenses were Rs. 450,000 (Allocate based on time).

Or

- (b) What do you understand by the buyback of securities? State any three objectives of a buyback. (CO2, K3)

13. (a) Explain the purpose and methodology of DuPont Analysis in interpreting financial performance. (CO3, K4)

Or

- (b) The current assets of a company are Rs. 500,000 and its current liabilities are Rs. 250,000. The inventory is valued at Rs. 150,000. Calculate the Current Ratio and Quick Ratio(Acid-Test Ratio) and comment on the company's liquidity. (CO3, K4)

14. (a) A project requires an initial investment of Rs. 200,000 and is expected to generate cash inflows of Rs. 60,000 per year for 5 years. Calculate the Payback Period. If the company's standard payback period is 4 years, should the project be accepted? (CO4, K5)

Or

- (b) Differentiate between Net Present Value (NPV) and Internal Rate of Return (IRR) as methods of capital budgeting. (CO4, K5)
15. (a) Explain the concept of 'Cost of Capital'. Why is the calculation of the Weighted Average Cost of Capital (WACC) important for a firm? (CO5, K3)

Or

- (b) A company has sales of Rs. 1,000,000, variable costs of Rs. 600,000, and fixed costs of Rs. 200,000. Its capital structure consists of debt of Rs. 500,000 at 10% interest. Calculate its Operating Leverage and Financial Leverage. (CO5, K3)

Part C

(5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Prepare a statement showing the depreciation for the years ended 31st March 2024, and 31st March 2025, from the following information: (CO1, K2)

A machine was purchased on 1st October 2023 for Rs. 5,00,000

An additional machine was purchased on 1st October 2024 for Rs. 2,00,000.

Depreciation is charged at 10% per annum using the Written-down value method.

Or

- (b) Explain the concepts of Human Resource Accounting (HRA). Discuss its advantages and the challenges in its implementation. (CO1, K2)

17. (a) Discuss the legal provisions and procedures involved in the alteration of share capital as per the Companies Act. (CO2, K3)

Or

- (b) Explain the term Employee Stock Option Plan (ESOP). Describe its benefits to both the employees and the company. (CO2, K3)
18. (a) The financial statements of ABC Ltd. are given below. (CO3, K4)

Balance Sheet as at 31st March 2025

Liabilities	Rs.	Assets	Rs.
Equity Share Capital	200,000	Fixed Assets	300,000
Reserves	100,000	Stock	100,000
10% Debentures	100,000	Debtors	80,000
Creditors	80,000	Cash	20,000
Total	480,000	Total	480,000

Income Statement for the year ended 31st March 2025

Particulars	Rs.
Sales	500,000
Cost of Goods Sold	350,000
Gross Profit	150,000
Operating Expenses	80,000
EBIT	70,000
Interest	10,000

Particulars	Rs.
Sales	500,000
Cost of Goods Sold	350,000
Gross Profit	150,000
Operating Expenses	80,000
EBIT	70,000
Interest	10,000
EBT	60,000
Tax (30%)	18,000
Net Profit	42,000

Calculate:

- (i) Debt-Equity Ratio,
- (ii) Gross Profit Ratio,
- (iii) Net Profit Ratio,
- (iv) Return on Equity.

Or

- (b) What is a Cash Flow Statement? Explain the classification of activities (Operating, Investing, and Financing) as per Accounting Standard 3 with examples. (CO3, K4)

19. (a) A company is considering investing in a project that costs 500,000. The project has a life of 5 years and the estimated cash flows after tax are as follows
(CO4, K5)

Year Cash Flow After Tax (Rs.)

1	120,000
2	140,000
3	160,000
4	180,000
5	200,000

The company's cost of capital is 10%. The Present Value factors at 10% are: Y1: 0.909, Y2: 0.826, Y3: 0.751, Y4: 0.683, Y5: 0.621. Calculate the Net Present Value (NPV) Profitability Index (PI). Advise the management.

Or

- (b) What is Behavioral Finance? Explain how psychological biases like 'Anchoring' and 'Herd Mentality' can lead to irrational investment decisions.
(CO4, K5)
20. (a) A company has the following capital structure
(CO5, K3)

Equity Share Capital (20,000 shares of Rs. 10 each):
Rs. 200,000

12% Preference Share Capital: Rs. 100,000

10% Debentures: Rs. 150,000

The market price per equity share is Rs. 25. The company is expected to declare a dividend of Rs.2 per share, which is expected to grow at 7% per annum. The corporate tax rate is 30%.

Calculate the Weighted Average Cost of Capital (WACC).

Or

- (b) What is Working Capital Management? Discuss the key determinants that influence the working capital needs of a business.
(CO5, K3)

R4293

Sub. Code

25MLM1C4

M.B.A. DEGREE EXAMINATION, NOVEMBER – 2025

First Semester

Logistics and Supply Chain Management

**FUNDAMENTALS OF LOGISTICS AND SUPPLY CHAIN
MANAGEMENT**

(CBCS – 2025 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective questions by choosing the correct option.

1. Logistics can be best defined as: (CO1, K1)
 - (a) The process of manufacturing goods
 - (b) The management of the flow of goods, services, and information
 - (c) The study of marketing research
 - (d) The process of demand forecasting

2. Which of the following is considered a key function of logistics? (CO1, K1)
 - (a) Product innovation
 - (b) Demand creation
 - (c) Warehousing and transportation
 - (d) Brand positioning

3. The main objective of Supply Chain Management is to: (CO2, K3)
- (a) Increase raw material cost
 - (b) Reduce customer satisfaction
 - (c) Maximise overall value creation
 - (d) Eliminate all intermediaries
4. The decision phases of a supply chain typically include: (CO2, K3)
- (a) Strategic, tactical, and operational
 - (b) Production, consumption, and disposal
 - (c) Planning, staffing, and control
 - (d) Marketing, sales, and after-sales
5. Warehousing is often called a logistical challenge because: (CO3, K4)
- (a) It only involves financial transactions
 - (b) It requires balancing storage and distribution efficiency
 - (c) It eliminates the need for packaging
 - (d) It replaces transportation activities
6. Which among the following is NOT a mode of transportation in logistics? (CO3, K4)
- (a) Rail
 - (b) Air
 - (c) Pipeline
 - (d) Market research

7. A major catalyst for logistics outsourcing is: (CO4, K2)
- (a) Decreasing customer expectations
 - (b) Cost reduction and focus on core business
 - (c) Elimination of technology
 - (d) Absence of competition
8. Third-party logistics (3PL) primarily refers to: (CO4, K2)
- (a) A company outsourcing logistics to external specialists
 - (b) A firm manufacturing all products internally
 - (c) Customers handling logistics by themselves
 - (d) Government regulating all supply chain operations
9. Lean supply chain focuses on: (CO5, K3)
- (a) Maximising waste and delays
 - (b) Reducing waste and improving efficiency
 - (c) Completely removing suppliers
 - (d) Ignoring customer demand
10. Green supply chain management primarily aims at: (CO5, K3)
- (a) Lowering financial accounting errors
 - (b) Minimising environmental impact of supply chain activities
 - (c) Increasing product obsolescence
 - (d) Eliminating recycling practices

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Explain the scope of logistics in detail. (CO1, K2)

Or

- (b) Describe the importance of customer service for competitiveness in logistics. (CO1, K2)

12. (a) Explain the evolution of Supply Chain Management. (CO2, K3)

Or

- (b) Describe the process view of a supply chain with an example. (CO2, K3)

13. (a) State the principles of material storage in logistics. (CO3, K4)

Or

- (b) Explain the role of inventory management in logistics operations. (CO3, K4)

14. (a) Discuss the benefits of third-party logistics outsourcing. (CO4, K2)

Or

- (b) Explain the concept of reverse logistics with suitable examples. (CO4, K2)

15. (a) Write a note on lean supply chain. (CO5, K3)

Or

- (b) Explain the concept of benchmarking in supply chain management. (CO5, K3)

Part C

(5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Discuss the functions of logistics in detail. (CO1, K4)

Or

- (b) Analyse the role of logistics in creating customer value. (CO1, K4)

17. (a) Critically examine the objectives and scope of Supply Chain Management. (CO2, K3)

Or

- (b) Explain supply chain dynamics and its impact on decision making. (CO2, K3)

18. (a) Analyse the challenges of warehousing in logistics operations. (CO3, K4)

Or

- (b) Discuss the importance of transportation management in logistics. (CO3, K4)

19. (a) Evaluate the role of fourth-party logistics in modern supply chains. (CO4, K2)

Or

- (b) Discuss the importance of technology in logistics outsourcing. (CO4, K2)

20. (a) Explain world-class supply chain management practices with examples. (CO5, K3)

Or

- (b) Critically analyse agile supply chains and their significance in today's environment. (CO5, K4)
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R4294

Sub. Code

25MLM1C5

M.B.A. DEGREE EXAMINATION, NOVEMBER – 2025

First Semester

Logistics and Supply Chain Management

**QUANTITATIVE TECHNIQUES FOR BUSINESS
DECISIONS**

(CBCS – 2025 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Which is NOT an assumption of LPP? (CO1, K3)
 - (a) Certainty of parameters
 - (b) Divisibility of decision variables
 - (c) Nonlinearity in objective function
 - (d) Additivity of contributions

2. The dual of a maximization LPP with \leq -type constraints is: (CO1, K3)
 - (a) Minimization with \geq constraints
 - (b) Maximization with \geq constraints
 - (c) Minimization with \leq constraints
 - (d) Maximization with equality constraints

3. In VAM, the penalty represents: (CO2, K4)
- (a) Difference between the two smallest costs in a row/column
 - (b) Sum of smallest costs
 - (c) Maximum of row costs
 - (d) A fixed constant per row
4. A balanced transportation problem with m sources and n destinations has basic feasible solutions with exactly: (CO2, K4)
- (a) $m + n$ variables
 - (b) $m + n - 1$ allocations
 - (c) mn allocations
 - (d) $m - n$ allocations
5. In Hungarian method, after covering zeros with minimum number of lines less than order, the next step is to: (CO3, K3)
- (a) Add smallest uncovered value to covered intersections
 - (b) Subtract smallest uncovered value from uncovered elements and add it to elements at line intersections
 - (c) Delete a row
 - (d) Switch to MODI method
6. An assignment problem is a special case of TP when: (CO3, K3)
- (a) All supplies and demands equal 1
 - (b) All costs are equal
 - (c) It is a maximization
 - (d) Balanced by dummy rows only

7. If A and B are independent, which is true? (CO4, K4)
- (a) $P(A \cap B) = P(A) + P(B)$
 - (b) $P(A \cap B) = P(A)P(B)$
 - (c) $P(A \cap B) = 0$
 - (d) $P(A | B) = 0$
8. Mean and variance of Poisson (λ) are: (CO4, K4)
- (a) λ and λ
 - (b) λ and $\sqrt{\lambda}$
 - (c) λ and λ^2
 - (d) $1/\lambda$ and λ
9. For an $M/M/1$ queue ($\mu > \lambda$), the average number in system L equals: (CO5, K4)
- (a) λ / μ
 - (b) $\lambda / (\mu - \lambda)$
 - (c) $\mu / (\mu - \lambda)$
 - (d) $\lambda \mu$
10. In Johnson's rule for 2-machine flow shop, if the smallest time is on Machine 2, place the job: (CO5, K4)
- (a) As early as possible
 - (b) In the middle
 - (c) As late as possible
 - (d) Randomly

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Formulate an LPP for two products A and B with profits Rs. 50 and Rs. 40 respectively. Each unit of A uses 3 hrs on M1 and 1 hr on M2; B uses 1 hr on M1 and 2 hrs on M2. M1 has 60 hrs, M2 has 40 hrs. Define variables, objective, constraints. (CO1, K3)

Or

- (b) State and explain any four limitations/assumptions of LPP that may affect real business modeling. (CO1, K3)

12. (a) Using VAM, find an initial BFS for the following (Rs.): (CO2, K4)

Supply: S1 = 30, S2 = 25, S3 = 20; Demand: D1 = 20, D2 = 30, D3 = 25

Costs:

	D1	D2	D3
S1	2	3	1
S2	5	4	8
S3	5	6	8

Or

- (b) Explain degeneracy in transportation problems and outline the procedure to handle it during MODI iterations. (CO2, K4)

13. (a) Solve the 3×3 minimization AP using Hungarian method and report optimal assignment and total cost. (CO3, K3)

	M1	M2	M3
J1	8	7	6
J2	4	2	5
J3	3	6	1

Or

- (b) Contrast TP and AP in at least five points and state situations where AP formulation is preferred. (CO3, K3)

14. (a) A machine produces defective items with probability $p = 0.2$ independently. For $n = 8$, compute $P(X = 3)$, $P(X \leq 2)$, and $E[X]$, $\text{Var}(X)$. (CO4, K4)

Or

- (b) Explain classical, relative-frequency, and subjective probability with two business examples each. (CO4, K4)

15. (a) In an M/M/1 queue with $\lambda = 10/\text{hr}$ and $\mu = 15/\text{hr}$, compute ρ, L, L_q, W, W_q . (CO5, K4)

Or

- (b) Define decision nodes, chance nodes, EMV and EVPI. Outline the steps of decision tree analysis. (CO5, K4)

Part C

(5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Solve by GRAPHICAL method: Max $Z = 40x + 30y$
subject to $3x + 2y \leq 60$, $x + 2y \leq 40$, $x \geq 0$, $y \geq 0$.
Identify corner points and optimum. (CO1, K3)

Or

- (b) Consider the LPP: Max $Z = 5X_1 + 4X_2$, s.t.
 $6X_1 + 4X_2 \leq 48$; $X_1 + 2X_2 \leq 12$, $X_1, X_2 \geq 0$
- (i) Formulate the dual and solve it;
- (ii) Find optimal primal solution and verify strong duality. (CO1, K3)

17. (a) Optimize the following BALANCED transportation problem to optimality using MODI (start with a VAM BFS). Report all $u - v$ potentials, Δ_{ij} values, and final minimum cost. (CO2, K4)

Supply : S1 = 40, S2 = 35, S3 = 25

Demand : D1 = 30, D2 = 50, D3 = 20

	D1	D2	D3
S1	4	6	8
S2	5	3	7
S3	6	5	4

Or

- (b) UNBALANCED TP: Supply S1 = 18, S2 = 22;
Demand D1 = 10, D2 = 12, D3 = 20. (CO2, K4)

Costs (Rs):

S1: 6 5 4

S2: 3 6 7

Balance with a dummy, obtain initial BFS (VAM) and optimize via MODI to optimality.

18. (a) Rectangular AP (3×4): Minimize total cost using Hungarian method by adding necessary dummies. (CO3, K3)

	W1	W2	W3	W4
A	7	5	9	6
B	6	4	3	7
C	5	8	6	5

Or

- (b) Maximization AP: Profits

	T1	T2	T3
E1	8	7	9
E2	6	9	5
E3	7	6	8

Convert to minimization and solve by Hungarian; report optimal assignment and maximum profit. (CO3, K3)

19. (a) Customer arrivals are Poisson with mean 4 per hour. Compute $P(X \leq 3 \text{ in } 1 \text{ hr})$ and the probability of at least one arrival in 15 minutes. (CO4, K4)

Or

- (b) $X \sim N(\mu = 100, \sigma = 15)$. Compute (i) $P(X > 120)$, (ii) the 95th percentile. (CO4, K4)

20. (a) Apply Johnson's rule to sequence 5 jobs through two machines and compute makespan. (CO5, K4)

Job:	J1	J2	J3	J4	J5
M1	8	6	7	5	9
M2	4	9	3	8	6

Or

- (b) Decision analysis: Alternatives A and B; market states High(0.5), Medium(0.3), Low(0.2). (CO5, K4)

Payoffs (Rs. lakhs)

	High	Med	Low
A:	18	11	-2
B:	14	9	5

- (i) Compute EMV for both and choose;
(ii) Compute EVwPI and EVPI.
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