BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – MBA-2025
Course Name – Quantitative Techniques and Optimization
Course Code - MBA20504
(Semester II)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Use transportation model when supply equals demand is called:_____.
a) Balanced b) Unbalanced
c) Degenerate d) Infeasible

(ii) Define quantitative techniques.
a) Qualitative judgment tools b) Mathematical decision tools
c) HR techniques d) Marketing tools

(iii) Identify the main objective of optimization.
a) Increase workload b) Maximize or minimize objectives
c) Reduce labor d) Increase cost

(iv) State the meaning of a decision variable.
a) Fixed input b) Controlled output
c) Unknown variable d) Decision outcome

(v) State the goal of transportation problem.
a) Maximize output b) Minimize cost
c) Increase supply d) Reduce demand

(vi) State the meaning of constraint in LPP.
a) Goal b) Limitation
c) Outcome d) Decision

(vii) List one assumption of LPP.
a) Risk b) Linearity
c) Uncertainty d) Ambiguity

(viii) Identify the method used for assignment problem.
a) MODI b) Hungarian
c) Simplex d) Monte Carlo

(ix) Define transportation problem.
a) Job allocation model b) Cost minimization model
c) Waiting line model d) Risk model

(x) Differentiate LP and non-LP models.
a) Certainty vs risk b) Linear vs nonlinear
c) Static vs dynamic d) Simple vs complex

(xi) Analyze the nature of solution if feasible region is empty.
a) Optimal b) Multiple

c) Infeasible d) Degenerate

(xii) Differentiate optimal and feasible solutions.

a) Same meaning b) All feasible are optimal

c) Optimal gives best value d) Feasible violates constraints

(xiii) Judge the appropriate decision rule for optimistic managers.

a) Maximin b) Maximax

c) Minimax regret d) EMV

(xiv) Assess whether LP can handle probabilistic coefficients.

a) Yes b) No

c) Sometimes d) Always

(xv) Evaluate whether degeneracy in a linear programming problem can lead to cycling during the solution process.

a) No b) Yes

c) Rarely d) Never

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Define quantitative techniques in management. (3)
3. Define Operations Research and state its primary objective. (3)
4. Apply the North-West Corner Rule to obtain an initial feasible solution of a transportation problem. (3)
5. Analyze the optimal assignment and minimum cost for the following cost matrix using the Hungarian Method. (3)

	J1	J2	J3
A	9	2	7
B	6	4	3
C	5	8	1

6. Use Graphical Method to solve the LPP Max $z = -2x_1 + x_2$ subject to $x_1 + 2x_2 \leq 10$, $x_1 + x_2 \leq 6$, $x_1 - x_2 \leq 2$, $x_1 - 2x_2 \leq 1$ and $x_1, x_2 \geq 0$ (3)

OR

Evaluate why graphical method is not suitable for LPPs with more than two variables. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. **Illustrate** the following production scheduling scenario and formulate it as a multi-period Linear Programming Problem: (5)

ABC Manufacturing produces two products X and Y over a 3-month planning horizon. Monthly data:

Product X: Profit = $40/unit, Production time = 2 hours/unit **Product Y:** Profit = $30/unit, Production time = 1.5 hours/unit

Monthly Constraints:

- Month 1: 300 hours available, Demand X ≥ 50, Demand Y ≥ 80
- Month 2: 350 hours available, Demand X ≥ 60, Demand Y ≥ 70
- Month 3: 280 hours available, Demand X ≥ 40, Demand Y ≥ 60

Inventory costs $2/unit/month for both products. Beginning inventory = 0.

8. **Evaluate** and solve the transportation problem using Vogel's Approximation Method (VAM): (5)

Three plants P1, P2, P3 have capacities 7, 9, 18 units respectively. Four warehouses W1, W2, W3, W4 have demands 5, 8, 7, 14 units respectively. The transportation costs per unit are:

PlantsWarehouses	W1	W2	W3	W4
P1	19	30	50	10
P2	70	30	40	60
P3	40	8	70	20

9. **Test** the following Linear Programming Problem using graphical method and identify all corner points: (5)

Maximize $Z = 3x_1 + 5x_2$

Subject to constraints:

- $x_1 + 4x_2 \leq 24$
- $3x_1 + x_2 \leq 21$
- $x_1 + x_2 \leq 9$
- $x_1, x_2 > 0$

10. Define a Linear Programming Problem and state its basic assumptions with a suitable example. (5)
11. Explain the concept of saddle point in a game. (5)
12. Evaluate the impact of introducing an additional constraint on the optimal solution of an LPP. (5)

OR

Evaluate the importance of sensitivity analysis in linear programming decisions. (5)

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