BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – M.Sc.(MATH)-2024
Course Name – Operations Research
Course Code - MSCMC401
(Semester IV)

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) A feasible solution to an LPP concluded as

a) must satisfy all of the problem's constraints simultaneously
b) must be a corner point of the feasible region
c) need not satisfy all of the constraints, only some of them
d) must optimize the value of the objective function

(ii) An iso-profit line explained as

a) an infinite number of solutions all of which yield same profit.
b) an infinite number of optimum solutions
c) An infinite number of solutions all of which yield the same cost.
d) a boundary line of the feasible region.

(iii) Consider a system of 2 simultaneous linear equations in 3 unknowns (2<3), select the number of basic variables.

a) 2
b) 3
c) 0
d) 5

(iv) To convert the transportation problem into a maximisation model we have to---Choose the correct answer.

a) write the inverse of the matrix
b) Multiply the rim requirements by –1
c) To multiply the matrix by –1
d) We cannot convert the transportation problem into a maximisation problem, as it is basically a minimisation problem

(v) In a transportation problem where the demand or requirement is equal to the available resource is explained as

a) Balanced transportation problem
b) Regular transportation problem
c) Resource allocation transportation problem
d) Simple transportation model

(vi) The opportunity cost of a row in a transportation problem is constructed by:

a) Deducting the smallest element in the row from all other elements of the row
b) Adding the smallest element in the row to all other elements of the row
c) Deducting the smallest element in the row from the next highest element of the row
d) Deducting the smallest element in the row from the highest element in that row.

(vii) Choose the correct option to construct the sentence-----In transportation model analysis the stepping-stone method is used to

a) obtain an initial optimum solution
b) obtain an initial feasible solution
c) evaluate empty cells for potential solution improvements
d) evaluate empty cells for possible degeneracy

(viii) While solving a transportation problem, the occurance of degeneracy interpret that

a) total supply equal to total demand
b) Solution so obtained is not feasible
c) few allocations become negative
d) none of these

(ix) If there is dominance in a game then---select the correct answer.

a) Least of the row ≥ highest of another row
b) Least of the row ≤ highest of another row
c) Every element of a row ≥ corresponding element of another row
d) Every element of the row ≤ corresponding element of another row.

(x) In case there is no saddle point in a game then the game identified as

a) Deterministic game
b) Fair game
c) Mixed strategy game
d) Multiplayer game

(xi) If small orders are placed frequently (rather than placing large orders frequently), then total inventory cost is…..recognize

a) Reduced
b) Increased
c) Either reduced or increased
d) Minimized

(xii) One of the important basic observations of Inventory management is

a) To calculate EOQ for all materials in the organisation
b) To go in person to the market and purchase the materials
c) To employ the available capital efficiently so as to yield maximum results
d) Once materials are issued to the departments, personally check how they are used.

(xiii) The stock of animals reared in anticipation of future demand is observed as:

a) Live stock inventory
b) Animal inventory
c) Flesh inventory
d) None of these.

(xiv) Identify correct one from follow "inventories is maintained to meet expected demand fluctuations"

a) Fluctuatory Inventory
b) Buffer stock
c) De-coupling inventory
d) Anticipatory inventory

(xv) Identify correct one from follow the cost that increases with quantity ordered per order is

a) Carrying cost
b) Ordering cost
c) Purchase cost
d) Demand.

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Identify the value of the game of the 2x2 person zero sum game (3)

	Player B			
Player A		B1	B2	B3
	A1	15	2	3
	A2	6	5	7
	A3	7	4	0

3. Examine only two basic feasible solution of the system of equations (3)

$2x_1 + 6x_2 + 2x_3 + x_4 = 3$

$6x_1 + 4x_2 + 4x_3 + 6x_4 = 2$

4. Consider the TP. You are given the allocations X11 = 20, X13 = 30, X21 = 10, X22 = 25 and X23 = 5. (3)

5	6	3	50
7	5	8	40
30	25	35	

Predict the above solution is optimum or not.

5. Distinguish between LPP and IPP. (3)

6. Explain customer behaviour in Queuing Theory and choose examples. (3)

OR

Justify the expression of the average number of customers in the system. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. The time estimates (in hours) for the activities of a PERT network are given below: (5)

Activity(i-j)	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Optimistic Time	1	1	2	1	2	2	3
Most Likely Time	1	4	2	1	5	5	6
Pessimistic Time	7	7	8	1	14	8	15

Where t_o is the optimistic time, t_p is the pessimistic time and t_m is the most likely time.

(i) Enumerate the project network
(ii) Identify all paths through it and write Critical path

8. Calculate the minimum cost corresponding to the 3 x 4 assignment problem: (5)

8	6	16	9
3	8	4	6
8	19	14	5

9. Use Graphical method to deduce the following game. (5)

		Player A			
		A1	A2	A3	A4
Player B	B1	2	2	3	-2
	B2	4	3	2	6

10. Deduce transportation cost of the following Transportation problem. (5)

	To			
From	A	B	C	Availability
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Requirement	4	2	2	

11. $\text{Max } z = 6x_1 + 5x_2$ (5)

Sub.to

$x_1 + x_2 \le 5$

$3x_1 + 2x_2 \le 12$

$x_1, x_2 \ge 0$

Use graphical method to evaluate this problem.

12. A wooden company make two types of doll. Each type-I sells for $27, uses $10 of raw materials and takes $14 of labor costs. Each type-II sells for $21, uses $9 of raw materials, and takes $10 of labor costs. Each type-I needs 2 hours finishing and 1 hour carpentry; each type-II needs 1 hour finishing and 1 hour carpentry. Raw materials are unlimited, but only 100 hours of finishing and 80 hours of carpentry are available each week. Demand for type-II is unlimited; but at most 40 type-I can be sold each week. Justify the above problem as a linear programming problem. (5)

OR

Define and assess the components of linear programming problem. (5)

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