

Indian Maritime University
(A Central University, Govt of India)
Supplementary Examinations – March/April 2025

Programme Name: BBA (LRE)
Semester: III
Subject Code: UG31T3305
Subject Name: Operations Research for business

Date: 22.03.2025

Max Marks: 70

Duration: 3 Hrs

Pass Marks: 35

Part A – 10 MCQs (10 X 01 Mark)

1. The inequality $x_1 + 4x_2 - 7x_3 \leq 11$ can be converted into equality by using:
 - (a) Slack variable.
 - (b) Surplus variable.
 - (c) Artificial variable.
 - (d) None of the above.
2. Maximization assignment problem is transformed into a minimization problem by
 - (a) Add each entry in a column from the maximum value in that column
 - (b) Subtracting each entry in a column from the maximum value in that column
 - (c) Subtracting each entry in the table from the maximum value in that table.
 - (d) Adding each entry in the table from the maximum value in that table.
3. When the sum of gains of one player is equal to the sum of losses to another player in a game, this situation is known as ____
 - (a) Two person game
 - (b) Two person non zero sum game
 - (c) Zero sum game
 - (d) Non zero sum game
4. If the problem is of maximization of the objective function, convert it into ____
 - (a) Minimization problem
 - (b) Optimal solution
 - (c) Transportation problem
 - (d) None of the above
5. In Program Evaluation Review Technique the maximum time that is required to perform the activity under extremely bad conditions is known as ____
 - (a) Normal time
 - (b) Optimistic time
 - (c) Most likely time
 - (d) Pessimistic time
6. The full form of IBFS
 - (a) Initial basic function solution
 - (b) Initial basical feasible solution
 - (c) Initial basic feasible solution
 - (d) None of the above

7. In a network diagram an event is denoted by the symbol
 - (a) arrow
 - (b) straight line
 - (c) curve
 - (d) circle
8. Which technique is used in finding a solution for optimizing a given objective, such as profit maximization or cost reduction under certain constraints?
 - (a) Queuing theory
 - (b) Gaming theory
 - (c) Linear programming
 - (d) Critical path method
9. The objective of network analysis is to _____.
 - (a) Minimize total project duration
 - (b) Minimize total project cost
 - (c) Minimize production delays, interruption and conflicts.
 - (d) Maximize total project duration.
10. The purpose of a dummy row or column in an assignment problem is to
 - (a) Obtain balance between total activities and total resources.
 - (b) Prevent a solution from becoming degenerate
 - (c) Provide a mean of representing a dummy problem.
 - (d) None of the above

Part B – 5 Short Questions (05 X 02 Marks)

11. What is a linear programming problem?
12. What are the basic characteristics of a queuing system?
13. What is the Hungarian method?
14. Explain mixed strategy in game theory?
15. What is a saddle point?

Part C – 7 Long Questions-Answer Any 5 (05 X 10 Marks)

16. Find the IBFS of the below transportation problem by Vogel's Approximation Method

	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

17. A service store employs one cashier as its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming poisson distribution for arrival rate and exponential distribution for service time. Find
 - (a) Average number of customer in the system
 - (b) Average number of customer in queue.
 - (c) Average time a customer spend in the system

18. What do you understand by an assignment problem? Give a brief outline for solving it?

19. Solve the game by dominance rule

		Player B					
		I	II	III	IV	V	VI
Player A	I	4	2	0	2	1	1
	II	4	3	1	3	2	2
	III	4	3	7	-5	1	2
	IV	4	3	4	-1	2	2
	V	4	3	3	-2	2	2

20. Following is the pay off table

State of nature	Acts			
	A ₁	A ₂	A ₃	A ₄
S ₁	16	11	8	9
S ₂	20	15	11	13
S ₃	25	16	11	22
S ₄	19	12	7	15

Find the optimal decision under:

- Minimax criteria
- Maximax criteria
- Laplace criteria

21. A project consists of the following activities and time estimates:

Activity	pessimistic	optimistic	Most likely
1-2	15	3	6
2-3	14	2	5
1-4	30	6	12
2-5	8	2	5
2-6	17	5	11
3-6	15	3	6
4-7	27	3	9
5-7	7	1	4
6-7	8	2	5

- Draw the project network
- Compute the expected duration of each activity
- Compute expected variance of each activity
- Compute the standard deviation of each activity
- Determine the critical path

22. Solve the following LP problem using simplex method

$$\text{Maximize } Z = 3x_1 + 2x_2 + 5x_3$$

Subject to

$$x_1 + 2x_2 + x_3 \leq 430$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 4x_2 \leq 420$$

$$x_1, x_2 \text{ and } x_3 \geq 0$$