Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – December 2023

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

Date: 18.12.2023 **Max Marks: 70**
Duration: 3 Hrs **Pass Marks: 35**

Part A – 10 MCQs (10 X 01 Mark)

1. The purpose of the transportation approach for locational analysis is to minimize
   (a) Total shipping costs.
   (b) Total variable costs.
   (c) Total fixed costs.
   (d) The number of shipments.
2. The presence of a group of customers who arrive randomly to receive some service is identified by
   (a) Reneging
   (b) Queuing
   (c) arrival
   (d) Service mechanism
3. If D is the duration, ES and EF are the earliest start and finish, LS and LF are latest start and latest finish time, and then the following relation holds good.
   (a) EF = ES +D
   (b) LS = LF +D
   (c) LF = LS + D
   (d) All of the above
4. A linear programming problem is one that is concerned with finding the…A…of a linear function called …B…Function of several variables (say x and y), subject to the conditions that the variables are ...C… and satisfy set of linear inequalities called linear constraints. Here A,B and C are respectively
   (a) Objective, optimal value , negative
   (b) Optimal value, objective , negative
   (c) Optimal value, objective , non-negative
   (d) Objective, optimal value, non- negative
5. In a zero sum game,
   (a) What one player wins, the other loses.
   (b) The sum of each player's winnings if the game is played many times must be zero.
   (c) The game is fair-each person has an equal chance of winning.
   (d) Long run profits must be zero.
6. The utilization factor for a system represents
   (a) The steady state average waiting time.
   (b) The probability that no one is in the system.
   (c) The probability that the service facility is being used.
   (d) The average number of customers in the queue.

7. One of the following is not a type of Float:
   (a) Total Float
   (b) Free Float
   (c) Mutually dependent Float
   (d) Independent Float
8. A feasible solution of a linear programming problem should:
   (a) Optimise the objective function
   (b) Satisfy all constraints and non-negative restrictions
   (c) Satisfy non- negative restrictions
   (d) Satisfy all constraints
9. The shortest possible time in which an activity can be achieved under ideal circumstances is known as _____
   (a) Pessimistic time estimate
   (b) Optimistic time estimate
   (c) Expected time estimate
   (d) The most likely time estimate
10. When the number of shipments in a feasible solution is > m+n1
   (a) The solution is optimal
   (b) There is degeneracy, and an artificial allocation must be created
   (c) A dummy source must be created
   (d) A dummy destination must be created

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

11. What is critical path?
12. Explain Unusual Customer Behaviour in queuing theory?
13. Explain transportation problem?
14. Solve the game whose pay-off matrix is given below:

Player A	**Player B**				
	BI	**B2**	**B3**	**B4**	**B5**
A1	-2	0	0	5	3
A2	3	2	1	2	2
A3	-4	-3	0	-2	6
A4	5	3	-4	2	-6

15. What is queuing theory?

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

16. Solve the transportation problem.

	D1	D2	D3	Supply
S1	5	1	7	10
S2	6	4	6	80
S3	3	2	5	50
Demand	75	20	50	

17. Solve the following assignment problem using Hungarian Method. The matrix entries are processing time of each man in hours.

Men	**I**	**II**	**III**	**IV**	**V**
Job 1	20	15	18	20	25
Job 2	18	20	12	14	15
Job 3	21	23	25	27	25
Job 4	17	18	21	23	20
Job 5	18	18	16	19	20

18. A branch of Punjab National Bank has only one typist. Since the typing work varies in length, the typing rate is randomly distributed approximately a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8 hour work day. If the typewriter is valued at Rs. 1.50 per hour. Determine
    (a) Equipment utilisation
    (b) The percent time an arriving letter has to wait
    (c) Average system time
    (d) Average cost due to waiting on part of typewriter

19. Solve the following game using Dominance property

Player A	Player B			
		I	II	III
	1	1	7	2
	2	6	2	7
	3	5	1	6

20. A project schedule has the following characteristics

Activity	Duration
1-2	13
1-3	12
2-4	2
3-4	8
2-5	15
4-5	2

(a) Draw the project network
(b) Determine the Critical path
(c) Compute Earliest Start Time, Earliest Finish Time, Latest Start Time, Latest Finish Time.

21. What are the time estimates in PERT?

22. Maximize $Z = x_1 + 4x_2$
Subject to $2x_1 + x_2 \leq 3$
$3x_1 + 5x_2 \leq 9$
$x_1 + 3x_2 \leq 5$
$x_1, x_2 \geq 0$