INDIAN MARITIME UNIVERSITY
BBA (Logistics, Retailing & E-Commerce)
Second Semester Examination 2022 June
Quantitative Techniques - II

Date:24.06.2022 **Time: 3 Hours**

Sub code: UG31T2205 **Max Marks=70**

SECTION A

10 X 1 = 10

Answer all the questions. All questions carry equal marks.

1. A feasible solution to an LPP
   a) Must satisfy all of the problem's constraints simultaneously
   b) Must be the 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 functions

2. If two constraints do not intersect in the positive quadrant of the graph, then
   a) one of the constraints is redundant
   b) the solution is infeasible
   c) the solution is unbounded
   d) none of the above.

3. The transportation problem is balanced, if
   a) total demand and total supply are equal and the number of sources equals the number of destination
   b) total demand equals total supply irrespective of the number of sources and destinations
   c) number of sources matches with the number of destinations
   d) none of the routes is prohibited.

4. In marking assignments, which of the following should be preferred:
   a) only that row that has a single zero
   b) only that column that has a single zero
   c) only a row/column that has a single zero
   d) only column having more than one zero

5. Queue can form only when
   a) arrivals exceed service capacity
   b) arrivals equal service capacity
   c) service facility is capable to serve all the arrivals at a time

d) there are more than one service facilities

6. When there is more than one server, customer behavior in which he moves from one queue to another is known as
    a) balking
    b) jockeying
    c) reneging
    d) alternating

7. A transportation problem can be represented as a network flow problem where
    a) origins represent sinks and destinations the sources
    b) origins represent sources and destinations the sinks
    c) objective is to maximize the network flow
    d) per unit transportation costs become irrelevant

8. In critical path analysis, the word CPM means
    a) Critical Path Method
    b) Crash Project Management
    c) Critical Project Management
    d) Critical Path Management

9. Which of the following is not used for decision-making under uncertainty?
    a) Minimax criterion
    b) Maximax criterion
    c) Minimize expected loss criterion
    d) Maximin criterion

10. When maximin and minimax values of the game are the same, then
    a) there is a saddle point
    b) solution does not exist
    c) strategies are mixed
    d) none of the above

SECTION B (5X2=10 Marks)

Answer all the questions. All questions carry equal marks.

11. Solve graphically:

Max $Z = 4x1 + 3x2$

Subject to constraints : $2x1 + x2 \leq 1{,}000$

$x1 + x2 \leq 800$

$x1 \leq 400$

$x2 \leq 700$ and

$x1, x2 \geq 0$

12. A department head has five subordinates and five tasks to be performed. The subordinates differ in efficiency, and the tasks differ in their intrinsic difficulty. His estimate, of the time each man would take to perform each task, is given in the matrix below. How should the tasks be allocated, one to a man, to minimize the total man-hours?

		Operators				
		1	**2**	**3**	**4**	**5**
Job	**1**	9	11	14	11	7
	2	6	15	13	13	10
	3	12	13	6	8	8
	4	11	9	10	12	9
	5	7	12	14	10	14

13. A TV repairman finds that the time spent on his job is an Exponential distribution with a mean of 30 minutes. If he repairs sets in the order in which they come in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8-hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought-in?

14. Draw (i)the network (N, L) where N and L are given by

N = {1, 2, 3, 4, 5, 6}

L = {1-2, 1-5, 2-3, 2-4, 3-5, 3-4, 4-3, 4-6, 5-2, 5-6}

(ii)Find a spanning tree for the network.

15. Solve the following 2-Person zero-sum game:

$$\begin{bmatrix} 15 & 2 & 3 \\ 6 & 5 & 7 \\ -7 & 4 & 0 \end{bmatrix}$$

SECTION C (5 X10 = 50) Marks

Answer any FIVE Questions All questions carry equal marks.

16. Use Simplex method to solve the L.P.P.:

Max : $z = 3x1 + 2x2$

Subject to constraints : $x1 + x2 \leq 4$,

$x1 - x2 \leq 2$,

$x1, x2 \geq 0$

17. Use two-phase simplex method to

Maximize $Z = 5x1 + 3x2$

Subject to constraints

$2x1 + x2 \leq 1$,

$X1 + 4x2 \geq 6$ and $x1, x2 \geq 0$.

18. Find the starting solution to the following transportation problem, by Vogel's Approximation Method. Also, obtain the optimum solution:

	D1	**D2**	**D3**	**D4**	**Supply**
S1	3	7	6	4	5
S2	2	4	3	2	2
S3	4	3	8	5	3
Demand	3	3	2	2	

19. The rate of arrival of customers at a public telephone booth follows Poisson distribution, with an average time of 10 minutes between one customer and the next. The phone call duration is assumed to follow an exponential distribution, with a mean time of 3 minutes.

(i) What is the probability that a person arriving at the booth will have to wait?

(ii) What is the average length of the non-empty queues that form from time to time?

(iii) The Mahanagar Telephone Nigam Limited will install a second booth when it is convinced that the customers would wait for at least 3 minutes to make a call. How much time should the flow of customers increase to justify a second booth?

(iv) Estimate the fraction of a day that the phone will be in use.

(v) What is the probability that it will take him more than 10 minutes altogether to wait for the phone and complete his call?

20. A project consists of a series of tasks labeled A, B, ….H, I with the following relationships (W<X, Y means X and Y cannot start until W is Completed; X, Y < W means W cannot start until both X and Y are completed). With this notation construct the network diagram having the following constraints:

A < D, E; B, D < F; C < G; B,G < H; F,G < I

Find also the minimum time of completion of the project, when the time (in days) of completion of each task is as follows.

Task :	A	B	C	D	E	F	G	H	I
Time :	23	8	20	16	24	18	19	4	10

21. Solve the game whose payoff matrix is given below:

	B1	B2	B3	B4
A1	4	-2	3	-1
A2	-1	2	0	1
A3	-2	1	-2	0

22. A research department of Hindustan Unilever has recommended to the marketing department to launch a shampoo of three different types. The marketing manager has to decide one of the types of shampoo to be launched under the following estimated payoffs for various levels of sales:

Types of shampoo	**Estimated levels of sale(units)**		
	15,000	**10,000**	**5,000**
Egg Shampoo	30	10	10
Clinic shampoo	40	15	5
Deluxe shampoo	55	20	5

What will be the marketing manager's decision if (i) maximin (ii) minimax (iii) maximax (iv)Laplace criteria are applied?