INDIAN MARITIME UNIVERSITY

(A Central University, Govt. of India)

End Semester Examinations – Dec 2019/Jan 2020

B.B.A (Logistics, Retailing and E-Commerce)

Semester - II

UG31T1205/2205 Quantitative Techniques II

Date: 16-12-2019 **Max Marks :100**

Time: 3 HRS **Pass Marks : 50**

Part – A

Answer all the Questions: 10 x 1 mark = 10 marks

1. Linear programming problem (LPP) must have an
   a) Objective (goal) that we aim to maximize or minimize
   b) Constraints (restrictions) that we need to specify
   c) Decision variables (activities) that we need to determine
   d) All of the above

2. The role of artificial variable in simplex method is
   a) To aid in finding initial basic feasible solution
   b) To start phases of simplex method
   c) To find shadow process from the final simplex table
   d) None of the above

3. The initial solution of a T.P. obtained by
   a) North-West corner rule would invariably be optimum.
   b) Least cost method does not provide the least cost solution to a T.P
   c) VAM would invariably be very near to optimum solution
   d) MODI method is infeasible.

4. An assignment problem can be
   a) Designed and solved as a transportation problem
   b) Of maximization type
   c) Solved only if number of rows equals the number of columns
   d) All of the above.

5. Queue can form only when
   a) Arrivals exceed service capacity
   b) Arrivals equals service capacity
   c) Service facility is capable to serve all the arrivals at a time
   d) None of the above

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

7. A minimal spanning tree involves
   a) All the node with cycles allowed
   b) All the nodes with cycles not allowed
   c) The shortest path between starting and ending nodes
   d) None of the above

8. Dijikstra's algorithm is designed to determine the shortest path between
   a) Any two nodes of the network
   b) The source node and any other node
   c) Any node and the destination node
   d) Any pair of the nodes of a unidirectional network.

9. When maxmin and minimax values of the game are same, then
   a) There is a saddle point
   b) Solution does not exit
   c) Strategies are mixed
   d) None of the above

10. A mixed strategy game can be solved by
   a) Matrix method
   b) Algebraic method
   c) Graphic method
   d) All of the above

Part – B

Answer any 6 questions not exceeding 200 words:

6 x 7marks = 42 marks

11. Use the graphical method to solve the following LPP:

Maximize $Z = 4X1 + 3X2$

Subject to constraints:

$2X1 + X2 \leq 1{,}000$

$X1 + X2 \leq 800$

$X1 \leq 400$ and $x2 \leq 700$

$X1, X2 \geq 0$

12. Use simplex method to solve the L.P.P:

Maximize $Z = 3X1 + 2X2$

Subject to constraints:

$X1 + X2 \leq 4$

$X1 - X2 \leq 2$

$X1 \geq 0, X2 \geq 0$

13. Obtain an initial basic feasible solution to the following T.P. using the matrix minima (Least – cost) method:

	D1	**D2**	**D3**	**D4**	**Capacity**
O1	1	2	3	4	6
O2	4	3	2	0	8
O3	0	2	2	1	10
Demand	4	6	8	6	

14. A departmental head has four subordinates, and four 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.

Tasks	**Men**			
	E	**F**	**G**	**H**
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

How should the tasks be allocated, one to a man, so as to minimize the total man-hour?

15. 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 duration of a phone call is assumed to follow exponential distribution, with 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 Ltd. Will install a second booth when it is convinced that the customers would expect waiting for at least 3 minutes for their turn to make a call. By how much time should the flow of customer's increase in order 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 phone and complete his call?

16. Use the notion of dominance to simplify the rectangular game with the following pay-off:

Player A	**Player B**				
		I	**II**	**III**	**IV**
	1	18	4	6	4
	2	6	2	13	7
	3	11	5	17	3
	4	7	6	12	2

Find its Graphical solution.

17. Draw 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} Find the spanning tree for the network.

18. A manager has a choice between (i) A risky contract promising Rs. 7 lakhs with probability 0.6 and Rs. 4 lakhs with probability 0.4 and (ii) A diversified portfolio consisting of two contracts with independent outcomes each promising Rs. 3.5 lakhs with probability 0.6 and Rs.2 lakhs with probability 0.4.
Construct a decision-tree for using EMV criteria. Can you arrive at the decision using EMV criteria?

Part – C

Question No:19 is compulsory.
Answer any 3 from the remaining 5 Questions, not exceeding 500 Words
4x12 marks = 48 marks

19. Define Queueing System. And explain the elements of a Queueing system.

20. Use Big M method to
Maximize $Z = 6X1 + 4X2$
Subject to constraints:
$2X1 + 3X2 \leq 30$
$3X1 + 2X2 \leq 24$
$X1 + X2 \geq 3$
$X1 \geq 0, X2 \geq 0$

21. Find the starting solution in 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	

22. 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

23. A project has the following time schedule:

Activity	1-2	1-3	1-4	2-5	3-6	3-7	4-6	5-8	6-9	7-8	8-9
Times in Weeks	2	2	1	4	8	5	3	1	5	4	3

Construct PERT network and compute: (i) Total float for each activity (ii) Critical path and its duration

24. A farmer wants to decide which of the three crops he should plant on his 100-acre farm. The profit from each is dependent on the rainfall during the growing season. The farmer has categorized the amount of rainfall as high, medium and low. His estimated profit for each is shown in the table below:

Rainfall	Estimated conditional profit (Rs)		
	Crop A	Crop B	Crop C
High	8,000	3,500	5,000
Medium	4,500	4,500	5,000
Low	2,000	5,000	4,000

If the farmer wishes to plant only one crop, decide which should be his 'best crop' using:

a) Maximin Criterion
b) Laplace criterion
c) Hurwicz criterion.