Indian Maritime University

(A Central University, Govt. of India)
BBA (Logistics, Retailing and E-Commerce)
UG31T1205 (Semester II)
Quantitative Techniques -II
May/June 2018 End Semester Examinations

Time: 3 Hours | Max Marks:100
Date: 01.06.2018 | Pass Marks:50

Section-A

Answer all the questions 1 & 2
Each question carry equal marks

1. **10 X 1 = 10 Marks**

A. Linear programming problem (LPP) must have an
   1. Objective (goal) that we aim to maximize or minimize
   2. Constraints (restrictions) that we need to specify
   3. Decision variables (activities) that we need to determine
   4. all of the above

B. When we solve a system of simultaneous linear equations by using Two - Phase simplex method, the values of decision variables may be
   1. Positive
   2. Negative
   3. Zero
   4. Positive and/or negative

C. The transportation problem is balanced, if
   1. total demand and total supply are equal and the number of sources equals the number of destinations.
   2. total demand equals total supply irrespective of the number of sources and destinations
   3. total number of sources matches with the number of destinations
   4. none of the routes is prohibited.

D. If there are n workers and n jobs, there would be
   1. n solutions
   2. n ! solutions
   3. (n-1)! solutions
   4. $(n!)^n$ solutions

E. Queue can form only when
    1. arrivals exceed service capacity
    2. arrivals equals service capacity
    3. service facility is capable to serve all the arrivals at a time
    4. there are more than one service facilities

F. For a "Poisson exponential, single server and infinite population" queuing model,
    1. the system has a single service facility,
    2. the arrival occur in a Poisson fashion,
    3. the service rate is according to the exponential distribution,
    4. all of the above

G. Which of the following O.R problems can not be expressed as a network flow problem?
    1. an assignment problem
    2. a transportation problem
    3. a replacement problem
    4. a queuing problem

H. In a critical path analysis, the word CPM means
    1. event oriented
    2. probabilistic in nature
    3. deterministic in nature
    4. dynamic in nature

I. When maximum and minimum values of the game are same, then
    1. there is a saddle point
    2. solution does not exist
    3. strategies are mixed
    4. none of the above

J. Decision analysis is concerned with
    1. decision making under certainty
    2. analysis of information that is available
    3. determining optimal decision in sequential manner
    4. all of the above

2. **5 X 1 = 5 Marks**

A. For maximization LPP, the objective function coefficient for an artificial variable is
    1. +M
    2. -M
    3. +1
    4. zero

B. The solution to a transportation problem with m-source and n-destinations is feasible, if the number of allocations are
    1. m+n-1
    2. m+n+1
    3. m+n
    4. m x n

C. The cost of providing service in a queuing system decreases with
    1. decreased arrival rate
    2. increased arrival rate
    3. decreased average waiting time in the queue
    4. none of the above

D. In PERT network, each activity time assume a ß- distribution, because
    1. it need not be symmetrical about model value
    2. it is uni-model distribution that provides information regarding the uncertainty of time estimates of activities
    3. it has got finite non-negative error
    4. all of the above

E. The size of the pay-off matrix of a game can be reduced by using the principle of
    1. dominance
    2. rotation reduction
    3. game inversion
    4. game transpose

Section-B (Questions 3-9) **5 X 5 = 25 Marks**

Answer any 5 out of 7 questions

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

Minimize $Z = -x_1 + 2x_2$;

Subject to constraints :

$-x_1 + 3x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$ and $x_1, x_2 \geq 0$.

4. Use simplex method to solve the following LPP

Maximize $Z = 4x_1 + 10x_2$;

Subject to constraints :

$2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

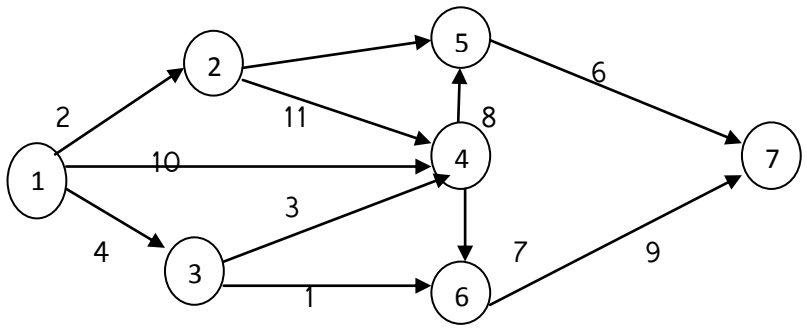
$2x_1 + 3x_2 \leq 90$ and $x_1, x_2 \geq 0$.

5. Suggest optimum solution to the following assignment problem and also the maximum sales:

Salesmen	Markets(sales in lakhs Rupees)			
	I	II	III	IV
A	44	80	52	60
B	60	56	40	72
C	36	60	48	48
D	52	76	36	40

6. A T.V. repairman finds that the time spent on his jobs has an Exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

7. The network below gives the permissible routes and their lengths in miles between stations of city 1 (node 1) and six other cities (nodes 2-7).



Determine the shortest route and hence the shortest distance from city 1 to city 7.

8. Obtain the optimal strategies for both persons and the value of the game for zero-sum two-person game whose payoff matrix is as follows:

$$\begin{pmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \\ 2 & 2 \\ -5 & 0 \end{pmatrix}$$

9. Define Decision Making problem. Discuss the steps involved in decision making process.

Section-C (Questions 10-15) 4 X 15 = 60 Marks

Question 10 is Compulsory
Answer any 3 out of the remaining 5 questions

10. What is queuing theory? Discuss the elements of queuing system and limitations of queuing theory.

11. Use two phase simplex method to solve

Max $Z = 5x1 + 3x2$

subject to $2x1 + x2 \leq 1$

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

12. 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	

13. Draw the network for the data given below and compute: (i)Critical path, (ii) Early start and Late start times for each activity, and (iii) Total slack for each activity:

Activity	:	A	B	C	D	E	F	G	H	I
Predecessor	:	-	-	-	A	B	C	D,E	B	H,F
Estimated Time(weeks	:	3	5	4	2	3	9	8	7	9

14. (a) Use the notation of dominance to simplify the rectangular game with the following pay-off: Find its graphical solution.

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

(b) Following is the pay-off matrix for player A:

		I	II	III	IV	V
Player A	I	2	4	3	8	4
	II	5	6	3	7	8
	III	6	7	9	8	7
	IV	4	2	8	4	3

Using dominance property, obtain the optimal strategies for both the players and determine the value of the game.

15. 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) Hurwicz criterion (farmer's degree of optimism being 0.6)

(b) Laplace criterion.

(c) Minmax regret criterion.