

INDIAN MARITIME UNIVERSITY
(A Central University, Govt.of India)

May/June 2015 End Semester Examinations

**SEMESTER – IV, M.B.A (INTERNATIONAL TRANSPORTATION AND LOGISTICS
MANAGEMENT)**

OPERATIONS RESEARCH (T 1403)

Date:10.06.2015

Time:-3 Hrs

Max.Marks:75

Pass Marks:38

SECTION – A

(10x1=10 Marks)

Answer ALL the questions. All question carry equal Marks

1. Operation Research approach is
 - a) intuitive
 - b) objective
 - c) multi-disciplinary
 - d) All of the above

2. If an iso-profit line yielding the optimum solution consider with a constraint line then,
 - a) The solution is unbounded
 - b) The solution is infeasible
 - c) The constraints which coincides is redundant
 - d) None of the above

3. In a maximum LPP if at least one artificial variable is in the basis, but not at zero level and the coefficient of M in each of the net evaluation($Z_j - C_j$) is non-negative, then we have
 - a) A feasible solution
 - b) No feasible solution
 - c) An unbounded solution
 - d) An optimum solution

4. The right hand side constant of a constraint in a primal problem appears in the corresponding dual as
 - a) a coefficient in the objective function
 - b) a right hand side constant of a constraint in a dual problem
 - c) an input- output coefficient
 - d) none of the above

5. While solving a transportation problem, the occurrence of degeneracy means that
 - a) Total supply equals total demand
 - b) The solution so obtained is not feasible
 - c) The few allocations become negative
 - d) None of the above

6. The payoff value for which each player in a game always select the same strategy is called the
 - a) Equilibrium point
 - b) Saddle point
 - c) Both (a) and (b)
 - d) None of the above

7. The size of the payoff matrix of a game can be reduced by using the principle of
 - a) Dominance
 - b) Rotation reduction
 - c) Game inversion
 - d) Game transpose

8. For a “Poisson exponential, single server and infinite population” queueing model
 - a) The system has a single service facility
 - b) The arrival occurs in a poisson fashion
 - c) The service rate is according to exponential distribution
 - d) All of the above

9. A minimal spanning tree involves
 - a) All the nodes with cycle allowed
 - b) All the nodes with cycles not allowed
 - c) The shortest path between starting and ending nodes
 - d) A connected network with all directed potential links

10. In critical path analysis, CPM is
 - a) Event oriented
 - b) Probabilistic nature
 - c) Deterministic in nature
 - d) Dynamic in nature

SECTION – B

(5x5=25 Marks)

Answer ANY five of the following questions. Each answer should not exceed 200 words.

11. Use simplex method to

Minimize	$Z = X_2 - 3X_3 + 2X_5$
Subject to	$3X_2 - X_3 + 2X_5 \leq 7$
	$-2X_2 + 4X_3 \leq 12$
	$-4X_2 + 3X_3 + 8X_5 \leq 10$
And	$X_2, X_3, X_5 \geq 0$

12. Write short notes on applications of OR

13. Determine an initial basic feasible solution to the following Transportation Problem using North – West corner method

	D1	D2	D3	D4	Availability
O1	5	3	6	2	19
O2	4	7	9	1	37
O3	3	4	7	5	34
Demand	16	18	31	25	90

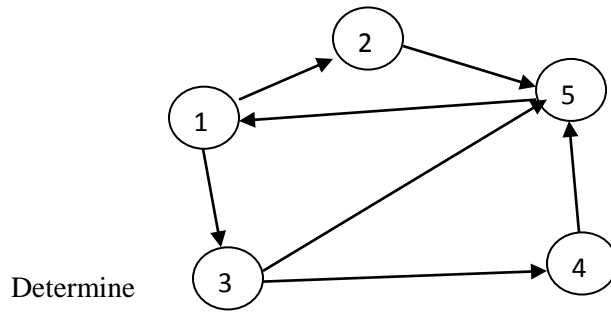
14. The following matrix represents the payoff to p1 in a rectangular game between two persons p1 and p2

$$P1 \begin{matrix} & P2 \\ \begin{bmatrix} 8 & 15 & -4 & -2 \\ 19 & 15 & 17 & 16 \\ 0 & 20 & 15 & 5 \end{bmatrix} \end{matrix}$$

By the notation of dominance, reduce the game to 2 X 4 games and solve it graphically.

15. Discuss Network definitions and notations.

16. Consider the following network



Determine

- a) Two paths b) A cycle c) Two directed cycles d) A tree e) A spanning tree

17. A supermarket has two girls serving at the counters. The customers arrive in a Poisson fashion at the rate of 12 per hour. The service time for each customer is exponential with mean 6 minutes. Find (i) the probability that an arriving customer has to wait for service (ii) the average number of customers in the system and (iii) the average time spent by a customer in the super-market.

SECTION – C

(4x10=40 Marks)

Question No. 18 is compulsory. Answer ANY THREE of the remaining questions

Each answer should not exceed 500 words.

18. Use two-phase simplex method to

$$\begin{aligned} \text{Maximize} \quad & Z = 5X_1 - 4X_2 + 3X_3 \\ \text{Subject to} \quad & 2X_1 + X_2 - 6X_3 = 20 \\ & 6X_1 + 5X_2 + 10X_3 \leq 76 \\ & 8X_1 - 3X_2 + 6X_3 \leq 50 \end{aligned}$$

19. Discuss the queueing system.

20. Given $x_{11}=20$, $x_{12} = 30$, $x_{22} = 40$, $x_{32}= 25$, and $x_{33}= 35$ units. Is it an optimal solution to the transportation problem?

	Available units			
	$\begin{pmatrix} 6 & 4 & 1 & 50 \\ 3 & 8 & 7 & 40 \\ 4 & 4 & 2 & 60 \end{pmatrix}$			
Demand	20	95	35	150

If not, modify it to obtain a better feasible solution.

21. Determine the optimum strategies and the value of the game

a)

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

b)

	p2			
p1	$\begin{pmatrix} 18 & 4 & 6 & 4 \\ 6 & 2 & 13 & 7 \\ 11 & 5 & 17 & 3 \\ 7 & 6 & 12 & 2 \end{pmatrix}$			

22. A project has the following time schedule :

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

Construct PERT network and compute

- (i) Total float for each activity ii) critical path and its duration

23. On an average 96 patients per 24-hour day require the service of an emergency clinic. Also on an average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs. 100 per patient treated to obtain an average servicing time of 10 minutes, and that each minute of decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from $1 \frac{1}{3}$ patient to $\frac{1}{2}$ a patient.
