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

Fourth Semester- MBA(ITL)
December 2015 End Semester Examinations

Operations Research
Subject Code: PG22T1403

Time : 3 hrs | Max.Marks :60
Date: 12.12.2015 | Pass Marks: 30

Section – A (MCQ)
Answer all the questions (10x1Marks = 10 Marks)

1. Linear programming problem (LP) must have an
   a. Objective (goal) that we aim to maximize or minimize
   b. Constraints (restrictions) that we need to determine
   c. Decision variables (activities) that we need to determine
   d. All of the above
2. If two constraints do not intersect in the positive quadrant of the graph, then
   a. One of the constraint is redundant
   b. The solution is infeasible
   c. The solution is unbounded
   d. None of these
3. For any primal and its dual,
   a. Optimum value of the objective function is same.
   b. Both primal and dual cannot be feasible.
   c. Primal will have an optimum solution if and only if dual does too.
   d. all the above
4. The initial solution of a T.P can be obtained by applying any known method. However, the only condition is that
   a. The solution must be optimum.
   b. The solution should be non-degenerate.
   c. The rim conditions are satisfied.
   d. All of the above.
5. The solution to a transportation problem with m-sources and n-destinations is feasible, if the numbers of allocations are
   a. m+n-1
   b. m+n+1
   c. m+n
   d. m*n

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. Games which involve more than two players are called

   a. biased games
   b. negotiable games
   c. conflicting games
   d. n-person games

8. In deterministic queuing model,
   a. arrival rate is known and the service time is also certain
   b. arrival rate must not exceed the service rate.
   c. the service rate and service time are reciprocals of each other.
   d. if the arrivals occur according to a poisson distribution, the inter-arrival times would be exponentially distributed.

9. Priority queue discipline may be classified as
   a. Finite or infinite
   b. limited or unlimited
   c. pre-emptive or non pre-emptive
   d. all of the above

10. Which of the following O.R. problems cannot be expressed as a network flow problem?
   a. an assignment problem.
   b. a transportation problem.
   c. A replacement problem.
   d. a queueing problem.

11. Among all possible "cuts" of flow in a network the minimal cut capacity corresponds to
   a. the minimal network flow.
   b. the maximal network flow.
   c. No network flow
   d. none of the above.

12. When maximin and minimax values of the game are same the
   a. There is a saddle point
   b. Solution does not exist
   c. Strategies are mixed
   d. None of the above

Section – B (200 Words)

Answer any 5 out of 7 (5x4 Marks=20 Marks)

13. Use simplex method to solve the following linear programming problem

$$\text{Max } Z = x1 + 4x2 + 5x3$$

Subject to constraints $3x1 + 3x3 \leq 22$

$$x1 + 2x2 + 3x3 \leq 14$$

$$3x1 + 2x2 \leq 14$$

and $x1, x2, x3 \geq 0.$

14. Discuss briefly the steps involved the solution of a transportation problem?

15. Obtain an initial basic feasible solution to the following transportation problem using the Matrix minima 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	

16. Determine the following two-person zero-sum games are strictly determinable and fair. Give the optimum strategies for each player in the case of strictly determinable games:

a) Player B

Player A	B1	B2
A1	-5	2
A2	-7	-4

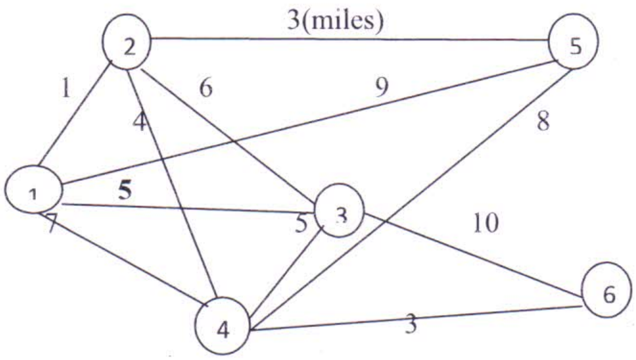
b) Player B

Player A	B1	B2
A1	10	6
A2	8	2

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

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

18. The Midwest T.V. Cable company is in the process of providing cable services to five new housing development areas. The figure below depicts the potential T.V linkages among the five areas. The cable miles are shown on each branch.



Determine the minimal spanning tree for the given network when

1. Nodes 3 and 5 are linked by a 2-mile cable.
2. Nodes 2 cannot be linked directly to node 3 and 5
3. Nodes 1 and 2 are linked by 8-mile cable.

19. What are the limitations of queuing models?

Section - C (500 Words, Case Study/ Essay Type)

First question of the section is compulsory (1x7Marks=7Marks)

Answer any 3 out of 5 (3x7 Marks=21 Marks)

20. Solve the following Linear Programming Problem using Two-Phase Method.

Minimize $Z = X1 + X2$

Subject to $2X1 + X2 \geq 4$

$X1 + 7X2 \geq 7$

$X1, X2 \geq 0$

21. Explain the Applications of Operation research briefly.

22. A company has factories at F1, F2, and F3 which supply warehouses at W1, W2 and W3 weekly factory capacities are 200, 160, and 90 units respectively. Weekly warehouses requirements are 180,120, and 150 units respectively. Unit shipping costs (in rupees) are as follows: Use Vogel's method to find the basic feasible solutions.

	W1	W2	W3
F1	16	20	12
F2	14	8	18
F3	26	24	16

23. Solve the following game and determine the value of the game:

a)

$$A \overset{B}{\begin{bmatrix} 6 & -3 \\ -3 & 0 \end{bmatrix}}$$

b)

$$X \overset{Y}{\begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}}$$

24. 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

25. In a heavy machine shop, the overhead crane is 75 per cent utilized. Time study observations gave the average slinging time as 10.5 minutes with a standard deviation of 8.8 minutes. What is the average calling rate for the services of the crane, and what is the average delay in getting services?. If the average service time is cut to 8.0 minutes, with standard deviation of 6.0 minutes, how much reduction will occur, on average, in the delay of getting seved? Model (M/G/I):(∞/FCFS) process.

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