

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

Fourth Semester- MBA (ITL- (2009-10 to 2012-13 Batches only))
December 2015 End Semester Examinations

Operations Research
Subject Code: PG22T1403

Time : 3 hrs
Date: 12.12.2015

Max.Marks :75
Pass Marks: 38

Section – A (MCQ)

Answer all the questions (10x1Marks = 10 Marks)

1. If an optimum solution is degenerate, then
 - a. the solution is infeasible
 - b. there are alternative optimum solutions
 - c. the solution is of no use to the decision maker
 - d. none of the above
2. A feasible solution to an LPP
 - a. Must satisfy all of the problem's constraints simultaneously
 - b. Must be a 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 function.
3. In transportation problem
 - a. A solution is said to be degenerate if the number of occupied cells is smaller than the number of rows plus the number of columns minus one(1)
 - b. A degenerate solution may or may not be optimum
 - c. To remove degeneracy, an infinitesimally small quantity is placed in each of the required number of independent cells
 - d. All of the above
4. 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
5. Which of the following is not a key operating characteristic for a queueing system:
 - a. average time a customer spent waiting in the system and queue.
 - b. utilization factor.
 - c. per cent idle time.
 - d. none of the above.

6. In PERT network, each activity time assume a β -distribution, because
 - a. it need not be symmetrical about modal value.
 - b. it is a uni-modal distribution that provides information regarding the uncertainty of time estimates of activities.
 - c. it has got finite non-negative error.
 - d. all of the above.
7. The slack for an activity in network, is equal to
 - a. LS-ES.
 - b. LF-LS.
 - c. EF-ES
 - d. EF-LS
8. Which of the following is not a key operating characteristic for a queuing system:
 - a. Average time a customer spent waiting in the system and queue..
 - b. utilization factor.
 - c. per cent idle factor.
 - d. none of the above
9. An augmenting path is an algorithm to find
 - a. A minimum cost flow pattern
 - b. A maximal cost flow pattern
 - c. A minimal spanning tree
 - d. A shortest path from source to sink
10. In critical path analysis, CPM is
 - a. Event oriented
 - b. Probabilistic nature
 - c. Deterministic in nature
 - d. Dynamic in nature

Section – B (200 Words)

Answer any 5 out of 7 (5x5 Marks=25 Marks)

11. Solve the following linear programming problem

$$\text{Max } Z = 3x_1 + 5x_2$$

$$\text{Subject to constraints } x_1 \leq 4$$

$$2x_2 \leq 12$$

$$3x_1 + 2x_2 \leq 18$$

$$\text{and } x_1, x_2 \geq 0.$$

12. Find an initial basic feasible solution to the following T.P. using north west corner method.

20	28	32	55	70	50
48	36	40	44	25	100
35	55	22	45	48	150
100	70	50	40	40	300

13. Write short notes on applications of OR

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

		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

Find its graphical solutions.

15. Discuss the characteristics of minimal spanning tree and its application.

16. Draw a network diagram for the following data :

Task	: A	B	C	D	E	F	G
Immediate predecessor	: No	No	B	B	B	E	A,D,C

17. A bank has two tellers working on savings accounts. The first teller handles withdrawals only. The second teller handles deposits only. It has been found that the service time distribution for both deposits and withdrawals is exponential with mean service time 3 minutes per customer. Depositors are found to arrive in Poisson fashion throughout the day with mean arrival rate of 16 per hour. Withdrawer also arrives in Poisson fashion with mean arrival rate of 14 per hour. What would be the effect on the average waiting time for depositors and withdrawers if each teller could handle both withdrawals and depositors? What could be the effect if this could be accomplished by increasing the mean service time to 3.5 minutes?

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

First question of the section is compulsory (1x10 Marks=10Marks)

Answer any 3 out of 5 (3x10 Marks=30 Marks)

18. Use duality to solve the following LPP:

$$\begin{aligned} & \text{Maximize } Z = 2X_1 + X_2 \\ \text{Subject to } & X_1 + 2X_2 \leq 10 \\ & X_1 + X_2 \leq 6 \\ & X_1 - X_2 \leq 2 \\ & X_1 - 2X_2 \leq 1 \\ & X_1, X_2 \geq 0 \end{aligned}$$

19. Given $x_{13} = 50$ units $x_{14} = 20$ units, $x_{21} = 55$ units $x_{31} = 30$ units $x_{32} = 35$ units and $x_{34} = 25$ units. Is it an optimal solution to the transportation problem?

				Available units	
	6	1	9	3	70
	11	5	2	8	55
	10	12	4	7	90

Required units 85 35 50 45

If not modify it to obtain a better feasible solution.

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

a)

		Y				
		6	3	-1	0	-3
X		3	2	-4	2	-1

b)

		p2			
		18	4	6	4
p1		6	2	13	7
		11	5	17	3
		7	6	12	2

21. 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:	3	5	4	2	3	9	8	7	9	
(Weeks)										

22. 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.

23. A barber shop has two barbers and three chairs for waiting customers. Assume that customers arrive in a poisson fashion at a rate of 5 per hour and that each barber services customers according to an exponential distribution with mean of 15 minutes. Further if a customer arrives and there are no empty chairs in the shops he will leave. Find the steady – state probabilities. What is the probabilities that the shop is empty?, What is the expected number of customers in the shop?
