LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIFTH SEMESTER – APRIL 2010

MT 5507/MT 5504 - OPERATIONS RESEARCH

Date & Time: 29/04/2010 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

SECTION - A

Answer all questions. (10 x 2 = 20)

1. What do you mean by an optimum basic feasible solution to a L.P.P?
2. Explain the term artificial variable and its use in linear programming.
3. What is an unbalanced transportation problem? How do we solve such a problem?
4. Give the mathematical formulation of an assignment problem.
5. What is a game in game theory? What are the properties of a game?
6. Explain the term 'two person zero sum game'.
7. Give two applications of PERT and CPM.
8. What is float? What are the different types of float?
9. What is ordering cost and carrying cost associated with an inventory?
10. Define the term Quantity discount.

Section B (5 x 8 = 40)

Answer any five questions. Each question carries eight marks.

11. Solve the following LPP by graphical method:

Minimise $z = 4x_1 - 2x_2$ subject to $x_1 + x_2 \le 14, 3x_1 + 2x_2 \ge 36, 2x_1 + x_2 \le 24, x_1, x_2 \ge 0.$

12. A marketing manager has five salesmen and five sales districts. Considering the capabilities, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be as follows:

		Districts				
		A	B	C	D	E
Salesmen	1	32	38	40	28	40
	2	40	24	28	21	36
	3	41	27	33	30	37
	4	22	38	41	36	36
	5	29	33	40	35	39

Find the assignment of salesmen to districts that will result in maximum sales.

13. Solve the following game whose pay – off matrix is given below:

	Player B			
Player A	B_1	B_2	B_3	B_4
A_1	3	2	4	0
A_2	3	4	2	4
A_3	4	2	4	0
A_4	0	4	0	8

14. Consider a project consisting of activities as given in the following table:

Activity	Predecessors	Duration(days)
A	-	6
B	A	4
C	B	7
D	A	2
E	D	4
F	E	10
G	-	2
H	G	10
I	J,H	6
J	-	13
K	A	9
L	C,K	3
M	I,L	5

Draw an arrow diagram for this project and indicate the critical path.

15. A company operating 50 weeks in a year is concerned about its stocks of copper cable. This costs Rs.240 a meter and there is a demand for 8,000 meters a week. Each replenishment costs Rs.1,050 for administration and Rs.1,650 for delivery, while holding costs are estimated at 25 per cent of value held a year. Assuming no shortages are allowed, what is the optimal inventory policy for the company?

16. Determine an initial feasible solution to the following transportation problem using VAM:

Source	D_1	D_2	D_3	D_4	Supply
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

17. A firm manufactures two products A and B on machines I and II as shown below:

Machine	Product		Available hours
	A	B	
I	30	20	300
II	5	10	110
Profit per unit(Rs)	6	8	

The total time available is 300 hours and 110 hours on machines I and II respectively. Products A and B contribute Rs. 6 and Rs. 8 per unit respectively. Formulate the primal problem and the dual problem and give their economic interpretation.

18. Write a note on the single item static inventory control model with single price break .

Section C (2 x 20 = 40)
Answer any two questions.

19. Use the dual simplex method to solve the LP problem:

Maximise $z = -2x_1 - x_3$ subject to the constraints $x_1 + x_2 - x_3 \geq 5, x_1 - 2x_2 + 4x_3 \geq 8$ and $x_1, x_2, x_3 \geq 0$.

20. A company has factories F_1, F_2 and F_3 which supply to warehouses at W_1, W_2 and W_3. Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouse requirements are 180, 120 and 150 units. Unit shipping costs (in rupees) are as follows:

Warehouses Factories	W_1	W_2	W_3	Supply
F_1	16	20	12	200
F_2	14	8	18	160
F_3	26	24	16	90
Demand	180	120	150	450

Determine the optimal distribution for this company to minimize the total shipping cost. Find the alternate solution also.

21. a) Use graphical method in solving the following game and find the value of the game.

	Player B			
Player A	B_1	B_2	B_3	B_4
A_1	2	2	3	-2
A_2	4	3	2	6

b) Explain the theory of dominance in the solution of rectangular games.

22. a) An item is produced at the rate of 50 per day. The demand occurs at the rate of 25 per day. If the set-up cost is Rs.100 per set-up and holding cost is Re.0.01 unit of item per day, find the economic lot size for one run, assuming that the shortages are not permitted. Also find the time of cycle and minimum total cost for one run.
b) Explain the maximal flow problem.