LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

SIXTH SEMESTER – APRIL 2010

ST 6601 - OPERATIONS RESEARCH

Date & Time: 17/04/2010 / 9:00 - 12:00 Dept. No. Max. : 100 Marks

PART – A

Answer ALL the questions **(10 x 2 = 20 marks)**

1. What is the general form of a Linear Programming Problem?
2. Define basic feasible solution.
3. What is an artificial variable?
4. Mention the two phases in the two-phase method.
5. What is degeneracy in a transportation problem?
6. What is an assignment problem?
7. Write down the rules to be followed while forming a network.
8. Distinguish between PERT and CPM.
9. State Salvage criterion in decision making under uncertainty.
10. What is a saddle point?

PART – B

Answer any FIVE questions **(5 x 8 = 40 marks)**

11. Describe the different phases of Operations Research.
12. Use graphical method to solve the following Linear Programming Problem.

Minimize $Z = 0.6x_1 + 0.8x_2$
subject to the constraints
$20x_1 + 30x_2 \geq 900$
$40x_1 + 30x_2 \geq 1200$
$x_1, x_2 \geq 0$

13. Explain the Big M method in solving a LPP.
14. A manufacturer has distribution centres at X, Y and Z. These centres have availability of 40, 20 and 40 units of product. His retail outlets at A, B, C, D and E require 25, 10, 20, 30 and 15 units respectively. Obtain an initial basic feasible solution using North West corner rule using the following table in which the transport cost (in Rs.) per unit between each centre and each outlet is given.

Distribution Centres	Retail Outlets				
	A	B	C	D	E
X	55	30	40	50	40
Y	35	30	100	45	60
Z	40	60	95	35	30

(P.T.O.)

15. A tourist car rental firm has one car in each of the five depots D_1, D_2, D_3, D_4, D_5 and a customer in each of the five cities C_1, C_2, C_3, C_4, C_5. The distances (in kilometers) between the depots and the cities are given in the following matrix. How should the cars be assigned to the customers so as to minimize the total distance covered?

Depots	Cities				
	C_1	C_2	C_3	C_4	C_5
D_1	140	115	120	30	35
D_2	110	100	90	30	15
D_3	155	90	135	60	50
D_4	170	140	150	60	60
D_5	180	155	165	90	85

16. A management is faced with the problem of choosing one of the three products A,B and C for manufacturing. The potential demand for each product may turn out to be good, fair and poor. The estimated profits under these three states of demand in respect of each product is given below:

Products	States of demand(Profits in rupees)		
	Good	Fair	Poor
A	70,000	40,000	-20,000
B	60,000	65,000	-10,000
C	55,000	45,000	15,000

Determine which alternative should be chosen under (i) Minimax Criterion
(ii) Laplace criterion (iii) Hurwicz Criterion, the degree of optimism being 0.6.

17. The Utility data for a network is given below. Determine the total, free and independent floats and identify the critical path.

Activity:	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration:	2	8	10	6	3	3	7	5	2	8

18. Solve the game whose pay-off matrix is

		Player B		
		1	2	3
Player A	1	4	-1	5
	2	0	5	3
	3	5	3	7

PART – C

Answer any TWO questions **(2 x 20 = 40 marks)**

19. (a) Show that the optimal solution of a LPP lies in a convex set.

(b) A company manufactures two types of telephone sets, one of which is cordless. The cord type telephone set requires 2 hours to make and the cordless model requires 4 hours. The company has atmost 800 work hours per day to manufacture these models and the packing department can pack atmost 300 telephone sets per day. If the company sells the cord type model for Rs.300 and the cordless model for Rs.400, then, how many telephone sets of each type should it produce per day to maximize its sales.

20. (a) Differentiate between simplex method and dual simplex method.

(b) Find the dual of the following problem and hence obtain the solution.

Minimize $Z = 20x_1 + 10x_2$
subject to:

$$x_1 + x_2 \geq 10$$
$$3x_1 + 2x_2 \geq 24$$
$$x_1 \geq 0, x_2 \geq 0$$

21. (a) A company has three plants at locations A,B and C which supply to warehouses located at D,E,F,G and H. Monthly plant capacities are 800,500 and 900 units respectively. Monthly warehouse requirement are 400,400,500,400 and 800 units respectively. Unit transportation costs (in Rs.) are given below:

		To				
		D	*E*	*F*	*G*	*H*
From	A	5	8	6	6	3
	B	4	7	7	6	6
	C	8	4	6	6	3

Determine an optimum distribution for the company in order to minimize the total transportation cost.

(b) Describe the traveling salesman problem.

22. (a) A small project consists of seven activities, the details of which are given below:

Activity	Duration(days)			Immediate predecessor
	Most likely	Optimistic	Pessimistic	
A	3	1	7	-
B	6	2	14	A
C	3	3	3	A
D	10	4	22	B,C
E	7	3	15	B
F	5	2	14	D,E
G	4	4	4	D

Draw the network and find the critical path, the expected project completion time.

(b) Explain a two-person zero sum game.

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