LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

SIXTH SEMESTER – **APRIL 2013**

ST 6604/ST 6601 - OPERATIONS RESEARCH

Date : 27/04/2013 Dept. No. Max. : 100 Marks
Time : 1:00 - 4:00

PART - A

Answer ALL the questions: (10 x 2 = 20)

1. Briefly explain the term Optimality.
2. Define LPP.
3. What is the difference between simplex and dual simplex method of solving LPP?
4. Define artificial variable.
5. What are the assumptions for a travelling salesman problem?
6. Define assignment problem.
7. What are the three time estimates in PERT?
8. What is a dummy variable?
9. Define a saddle point?
10. Mention any two criteria for decision under uncertainty.

PART – B

Answer any FIVE questions: (5 x 8 = 40)

11. Explain the graphical method of solving a LPP.
12. Solve the given LPP to obtain optimal solution.

    Minimize $Z=X_1 1-3X_2+2X_3$

    Subject to the constraints

    $3X_1-X_2+2X_3 \le 7$

    $-2X_1+4X_2 \le 12$

    $-4X_1+3X_2+8X_3 \le 10$

    $X_1 \ge 0\; X_2 \ge 0, X_3 \ge 0$

13. What are the steps involved in solving an assignment problem using Hungarian method to calculate the maximum solution?
14. Find the initial basic feasible solution to the following transportation problem using VAM.

$$\begin{array}{cc} & \begin{array}{cccc} D_1 & D_2 & D_3 & D_4 \end{array} & Supply \\ \begin{array}{c} S_1 \\ S_2 \\ S_3 \end{array} & \begin{bmatrix} 20 & 25 & 28 & 31 \\ 32 & 28 & 32 & 41 \\ 18 & 35 & 24 & 32 \end{bmatrix} & \begin{array}{c} 200 \\ 180 \\ 110 \end{array} \\ Demand & \begin{array}{cccc} 150 & 40 & 180 & 170 \end{array} & \end{array}$$

15. A businessman has three alternatives open to him each of which can be followed by any of the four possible events. The conditional payoffs(in Rs.) for each action- event combination are given below:

Alternative	Payoffs conditional on events			
	A	B	C	D
X	8	0	-10	6
Y	-4	12	18	-2
Z	14	6	0	8

Determine which alternative should the businessman choose, if he adopts

a) Maximin criterion

b) Savage criterion.

16. Explain the principle of dominance in game theory?

17. What are the different types of floats present in the activity?

18. A small project consists of seven activities for which the relevant data are given below:

Activity	Preceding Activity	Duration (in days)
A	-	4
B	-	7
C	-	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

a) Draw the network diagram and find the completion time.

b) Calculate total float and find CPM.

PART – C

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

19. a) Find the dual for the given primal. **(5)**

$Maximize\ Z = 2X_1 + X_2$

$Subject\ to\ the\ constraints$

$X_1 + 2X_2 \leq 10$

$X_1 + X_2 \leq 6$

$X_1 - X_2 \leq 2$

$X_1 - 2X_2 \leq 1$

$X_1 \geq 0,\ X_2 \geq 0$

19. b) Use Big M method to solve the given LPP **(15)**

$Maximize\ Z = 6X_1 + 4X_2$

$Subject\ to\ the\ constraints$

$2X_1 + 3X_2 \leq 30$

$3X_1 + 2X_2 \leq 24$

$X_1 + X_2 \geq 3$

$X_1 \geq 0,\ X_2 \geq 0$

20. a) A machine operator processes five types of items on his machines each week, and must choose a sequence for them. The set-up cost per change depends on the item presently on the machine and the set-up to be made according to the following table: **(10)**

From Item	To Item A	B	C	D	E
A	∞	4	7	3	4
B	4	∞	6	3	4
C	7	6	∞	7	5
D	3	3	7	∞	7
E	4	4	5	7	∞

Find the TC.

20. b) What are steps involved in solving a transportation problem to find the initial basic feasible solution using Least Cost Method. **(10)**

21. a) What are the different methods to solving a mixed strategy game? **(5)**

21. b) Solve the following game: **(15)**

$$\begin{array}{cc} & \text{Player A} \\ & \begin{array}{cccc} \text{I} & \text{II} & \text{III} & \text{IV} \end{array} \\ \text{Player B} \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \end{array} & \begin{bmatrix} 18 & 4 & 6 & 4 \\ 6 & 2 & 13 & 7 \\ 11 & 5 & 17 & 3 \\ 7 & 6 & 12 & 2 \end{bmatrix} \end{array}$$

22. a) Explain PERT algorithm in detail. **(8)**

22. b) A project schedule has the following characteristics: **(12)**

Activity Time	Most optimistic time	Most likely time	Most pessimistic time
1 – 2	1	2	3
2 – 3	1	2	3
2 – 4	1	3	5
3 – 5	3	4	5
4 – 5	2	3	4
4 – 6	3	5	7
5 – 7	4	5	6
6 – 7	6	7	8
7 – 8	2	4	6
7 – 9	4	6	8
8 – 10	1	2	3
9 - 10	3	5	7

a) Draw the network diagram and find the expected project completion time.

b) Find the probability of completing the project in 30 weeks.

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