LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – **APRIL 2015**

ST 6607/ST 6604/ST 6601 - OPERATIONS RESEARCH

Date : 17/04/2015 Dept. No. Max. : 100 Marks

Time : 09:00-12:00

PART – A

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

1) What is Operations Research?
2) State the canonical form of LPP.
3) What is the role of artificial variables in the simplex method?
4) Construct the dual to the primal problem

   Maximize $Z = 3x_1 + 5x_2$

   Subject to $2x_1 + 6x_2 \leq 50$

   $3x_1 + 2x_2 \leq 35$

   $5x_1 - 3x_2 \leq 10$

   $x_1 \geq 0,\ x_2 \geq 0$
5) What is meant by unbalanced transportation problem?
6) What is an assignment problem?
7) Define the term "activity" in network analysis.
8) Define critical path.
9) Define maximax criterion.
10) Define Two Person Zero Sum game.

PART – B

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

11) Write the essential characteristics of Operations Research.
12) A person wants to decide the constituents of a diet which will fulfil his daily requirements of proteins, fats and carbohydrates at the minimum cost. The choice is to be made from four different types of foods. The yields per unit of these foods are given in the following table

Food type	Yield per unit			Cost per unit (Rs.)
	Proteins	**Fats**	**Carbohydrates**	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum requirements	800	200	700	

Formulate linear programming model for the problem.

13) Explain the various steps involved in two phase method for solving a LPP.

14) Solve the assignment problem with the following cost matrix.

Contractors

		I	II	III	IV
subassemblies	**1**	15	13	14	17
	2	11	12	15	13
	3	13	12	10	11
	4	15	17	14	16

15) Tasks A, B, C,… ,H, I constitute a project. The precedence relationships are A < D; A < E; B < F; D < F; C < G; C < H; F < I; G < I. Draw a network to represent the above project.

16) Explain the different environments in which decisions are made?

17) Reduce the following game by dominance property and solve it.

Player A	Player B				
	1	**2**	**3**	**4**	**5**
I	1	3	2	7	4
II	3	4	1	5	6
III	6	5	7	6	5
IV	2	0	6	3	1

18) Explain Vogel's approximation method to obtain IBFS in transportation problem.

PART – C

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

19) a) Describe different phases of Operations Research.

b) Solve the following LPP graphically.

$$\text{Max } Z = 3x_1 + 4x_2$$

Subject to $5x_1 + 4x_2 \leq 200$

$3x_1 + 5x_2 \leq 150$

$5x_1 + 4x_2 \geq 100$

$8x_1 + 4x_2 \geq 80$

$x_1 \geq 0,\ x_2 \geq 0.$

20) a) Explain Dual Primal relationship.

b) Use the Big-M method to solve the following LPP

$$\text{Max } Z = 3x_1 - x_2$$

Subject to $2x_1 + x_2 \leq 2$

$x_1 + 3x_2 \geq 3$

$x_2 \leq 4$

$x_1 \geq 0,\ x_2 \geq 0.$

21) a) Find the optimum solution to the following transportation problem in which the cells contain
the transportation cost in rupees.

	W_1	W_2	W_3	W_4	W_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	

b) A project schedule has the following characteristics

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (weeks)	4	1	1	1	6	5	4	8	1	2	5	7

(i) Construct the network.

(ii) Find the Critical Path.

22) a) A steel manufacturing company is concerned with the possibility of a strike. It will cost an
extra Rs. 20,000 to acquire an adequate stockpile. If there is a strike and the company has not
stockpiled, management estimates an additional expense of Rs.60,000 on account of lost sales.
Should the company stockpile or not if it is to use, (i) Maximax criterion (ii) Maximin criterion
(iii) Savage criterion (iv) Hurwicz criterion for $\alpha = 0.4$ (v) Laplace criterion.

b) Solve the following 2 X 5 game by graphic method.

Player B

Player A

	I	II	III	IV	V
1	-5	5	0	-1	8
2	8	-4	-1	6	-5

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