KS INSTITUTE OF TECHNOLOGY BANGALORE
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
15CS653/OPERATIONS RESEARCH
EXHAUSTED QUESTION BANK

MODULE-1
Introduction, Linear Programming(LPP)

1. What is Operations Research? Explain the six phases of an Operations Research study?

2. Explain the Following
   (i) Origin, Nature and Impact of QR
   (ii) Defining the problem

3. Show how Linear Programming model can be formulated for the problem given below. The Apex Television Company has to decide on the number of 27- and 20-inch sets to be produced at one of its factories. Market research indicates that at most 40 of the 27-inch sets and 10 of the 20-inch sets can be sold per month. The maximum number of work-hours available is 500 per month. A 27-inch set requires 20 work-hours and a 20-inch set requires 10 work-hours. Each 27-inch set sold produces a profit of $120 and each 20-inch set produces a profit of $80. A wholesaler has agreed to purchase all the television sets produced if the numbers do not exceed the maxima indicated by the market research.

4. Show how Linear Programming model can be formulated for the problem given below. A farmer has to plant two kinds of trees P and Q in a land of 4000 sqm area. Each P tree requires at least 25 sqm and Q tree requires at least 40 sqm of land, the annual water requirements of P tree is 30 units and of Q tree is 15 units per tree, while at most 3000 units of water is available. It is also estimate that the ratio of the number of Q trees to the number of P trees should not be less than 6/19 and should not be more than 17/8. The return per tree from P is expected to formulate the problem as a LP model.

5. Infer the concept of Graphical method to solve the following LPP

   Max $Z = 5x1 + 4x2$
   Subject to $6X1 + 4x2 \leq 24$
   $X1 + x2 \leq 6$
   $-X1 + x2 \leq 1$
   $X1 \leq 2$
   and $x1, x2 \geq 0$

6. Explain the following terms with examples?
   1) Feasible solution
   2) Feasible region

3) Infeasible region
4) Optimal solution
5) CPF solution
6) Unbounded solution

7. Show how Linear Programming model can be formulated for the problem given below. ABC firm manufactures three products P_1, P_2 and P_3. The profits are Rs 30, Rs 20 and Rs 40. Respectively the firm has two machines M_1 and M_2 and requires processing times in minutes for each machine on each product and total machine available minutes on each machines are given below:

Machine	Machine minutes required			Total machine minutes available
	P_1	P_2	P_3	
M1	4	3	5	2000
M2	2	2	4	2500

The firm must manufactures at least 100 P_1 's and 200 P_2 's and 50 P_3 's but not more than 150 P_1 's. Setup LP model.

8. Infer the concept of Graphical method to solve the following LPP

Maximize $z=3x_1-2x_2$
subject to $x_1+x_2 \leq 1$,
$2x_1+2x_2 \geq 4$,
and $x_1, x_2 \geq 0$

9. Interpret the concept of Graphical method to solve the following LPP

Max $Z = 3x1 + 5x2$
Subject to $x1 \leq 4$
$2x2 \leq 12$
$3X1 + 2x2 \leq 18$
and $x1 , x2 \geq 0$

10. Show how Linear Programming model can be formulated for the problem given below. A manufacture produces three models I, II, III of certain product using raw materials A and B. The following tables give the data for the product.

Raw Materials	Requirement per unit			Availability
	I	II	III	
A	2	3	5	4000

B	4	2	7	6000
Minimum demand	200	200	150	___
Profit per unit (Rs)	30	20	50	___

Formulate the problem as a linear program model

11. Interpret the concept of Graphical method to solve the following LPP
Maximize $Z = 10x_1 + 20x_2$
STC $-x_1 + 2x_2 \leq 15$
$x_1 + x_2 \leq 12$
$5x_1 + 3x_2 \leq 45$
and $x_1, x_2 \geq 0$

12. Interpret the concept of Graphical method to solve the following LPP
Max $Z = -0.4x_1 - 0.5x_2$
STC
$0.3x_1 + 0.1x_2 \leq 2.7$
$0.5x_1 + 0.5x_2 = 6$
$0.6x_1 + 0.4x_2 \geq 6$
And $x_1, x_2 \geq 0$

13. Briefly explain the assumptions required in Linear Programming Models.

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MODULE-2
Simplex Method – 1

1. Show all the basic solutions of the following equations identifying in each case the basic and non basic variables.
$2x_1 + x_2 + 4x_3 = 11$
$3x_1 + x_2 + 5x_3 = 14$

2. Identify the meaning of following terms with respect to an LPP. Give example for each:

i)	Optimal solution
ii)	CPF solution
iii)	Unbounded solution.
iv)	Feasible solutions.
v)	Infeasible solution.
vi)	Feasible region.
vii)	slack variables.
viii)	surplus variables
ix)	artificial variables

3. Identify the procedure of Simplex method to find optimal solution to solve LPP.

4. Solve the LPP Using simplex method.

$$\text{Max } Z = 4x1 + 3x2 + 6x3$$

Subject to the constraints $2x_1 + 3x_2 + 2x_3 \leq 440$

$$4x1 + 3x_3 \leq 470$$

$$2x_1 + 5x_2 \leq 430$$

And $x_1, x_2, x3 \geq 0.$

5. Solve the LPP Using simplex method.

$$\text{Minimize } Z = x_2 - 3x_3 + 2x_5$$

Subject to the constraints $x_1 + 3x_2 - x_3 + 2x_5 = 7$

$$-2x_2 + 4x_3 + x_4 = 12$$

$$-4x_2 + 3x_3 + 8x_5 + x_6 = 10$$

And $x_1, x_2, \ldots\ldots\ldots\ldots x_6 \geq 0.$

6. Identify the concept of Degeneracy in simplex method?

7. Solve the LPP Using simplex Method.

$$\text{Max } Z = 3x1 + 2x2$$

STC $x1 + x_2 \leq 4$

$$x_1 - x2 \leq 2$$

And $x_1, x_2 \geq 0.$

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MODULE-5
Game Theory

1. Identify the details of Metaheuristics, its nature, advantage and disadvantage.
2. Identify the details of Tabu search algorithm.
3. Identify the details of Simulated annealing algorithm
4. Identify the details of Genetic algorithm
5. Solve the game given by method of subgames.

		B		
		I	II	III
A	I	275	-50	-75
	II	125	130	150

6. Solve the following 3x3 game by the method of matrices:

1	-1	-1
-1	-1	3
-1	2	-1