7. LINEAR PROGRAMMING PROBLEMS

I. MCQ (2 marks each)

1. The corner points of the feasible solutions are (0,0) (3,0) (2,1) (0,7/3) the maximum value of Z = 4x+5y is
   a) 12 b) 13 c) 35/3 d) 0
2. The half plane represented by 4x+3y >14 contains the point
   a) (0,0) b) (2,2) c) (3,4) b) (1,1)
3. The feasible region is the set of point which satisfy
   a) The object functions
   b) All the given constraints
   c) Some of the given constraints
   d) Only one constraint
4. Objective function of LPP is
   a) A constraint
   b) A function to be maximized or minimized
   c) A relation between the decision variable
   d) Equation of straight line
5. The value of objective function is maximum under linear constraints
   a) At the center of the feasible region
   b) At (0,0)
   c) At vertex of feasible region
   d) At (-1, -1)
6. If a corner point of the feasible solutions are (0,10) (2,2) (4,0) (3,2) then the point of minimum Z = 3x + 2y is
   a) (2,2) b) (0,10) c) (4,0) b) (3,2)
7. The point of which the maximum value of z= x+y subject to constraints $x+2y\leq 70$, $2x+y \leq 90$, $x\geq 0$, $y\geq 0$ is obtained at
   a) (30,25) b) (20,35) c) (35,20) b) (40,15)
8. A solution set of the inequality $x \geq 0$
   a) Half plane on the Left of y axis
   b) Half plane on the right of y axis excluding the point on y-axis

c) Half plane on the right of y axis including the point on y axis

d) Half plane on the upword of x axis

9. Which value of x is in the solution set of inequality $-2X+Y \geq 17$

a) - 8 b) -6 c) -4 b) 12

10. The graph of the inequality $3X- 4Y \leq 12$, $X \leq 1$, $X \geq 0$, $Y \geq 0$ lies in fully in

a) I quadrant b) II quadrant c) III quadrant b) IV quadrant

II. Short Answers (2 marks)

1. Solve $4x-18 \geq 0$ graphically using xy plane
2. Sketch the graph of inequation $x \geq 5y$ in xoy co-ordinate system
3. Find the graphical solution for the system of linear inequation $2x+y \leq 2$, $x-y \leq 1$
4. Find the feasible solution of linear inequation $2x+3y \leq 12$, $2x+y \leq 8$, $x \geq 0$, $y \geq 0$ by graphically
5. Solve graphically $x \geq 0$, $y \geq 0$
6. Find the solution set of inequalities $0 \leq x \leq 5$, $0 \leq 2y \leq 7$
7. Find the feasible solution of in equations $3x+2y \leq 18$, $2x+ y \leq 10$, $X \geq 0$, $Y \geq 0$
8. Draw the graph of inequalities $x \leq 6$, $y- 2 \leq 0$, $x \geq 0$, $y \geq 0$ and indicate the feasible region
9. Check the ordered points (1, - 1), (2, - 1) is a solution of $2x+3y-6 \leq 0$
10. Show the solution set of inequations $4x – 5y \leq 20$ graphically

III Short Answer type questions. (3 marks)

1) A manufacturer produces bulbs and tubes. It takes one hour on machine M_1 and three hours of machine M_2 to produce one package of bulbs. While it takes two hours on machine M_1 and four hours of machine M_2 to produce one package of tubes. He earns a profit of Rs. 135 per package of bulbs and Rs. 550 per package of tubes. How manypackages of each item should be produced each day so as to maximize his profit, if he operates machine M_1 for at most 10 hours a day and machine M_2 for atmost 12 hours a day ? Form the LPP.

2) A company manufactures two types of fertilizers E and F. Each type of fertilizer requires two raw materials A and B. The number of units of A and B required to manufacture one unit of fertilizer E and F and availability of the raw materials A and B per day are given in the table. By selling one unit of E and one unit of F, the company gets a profit of Rs. 500 and Rs. 750 respectively. How many units of E and F should the company manufacture daily so as to maximize its profit ? Formulate the problem as LPP.

Raw Material	Fertilizer		Availability
	E	F	
A	2	3	40
B	1	4	70

3) A construction company uses blocks made up of cement and sand. The weight of a concrete block has to be at least 5 kg. Cement costs Rs. 20 per kg, while sand costs Rs. 6 per kg. Strength considerations dictate that the concrete block should contain minimum 4 kg of cement and not more than 2 kg of sand. Form the LPP for cost to be minimum.

III. Long Answers (4 marks)

1. Maximize $z = 5x+2y$ subject to $3x+5y \leq 15$, $5x+2y \leq 10$, $x \geq 0$, $y \geq 0$
2. Maximize $z= 7x+11y$ subject to $3x+5y \leq 26$, $5x+3y \leq 30$, $x \geq 0$, $y \geq 0$
3. Maximize $z=10x+25y$ subject to $x+y \leq 5$, $0 \leq x \leq 3$, $0 \leq y \leq 3$
4. Maximize $z=3x+5y$ subject to $x+4y \leq 24$, $3x+y \leq 21$, $x+y \leq 9$, $x \geq 0$, $y \geq 0$ also find the maximum value of z
5. Minimize $z=8x+10y$ subjected to $2x+y \geq 7$, $2x+3y \geq 15$, $y \geq 2$, $x \geq 0$, $y \geq 0$
6. Minimize $z=7x+y$ subjected to $5x+y \geq 5$, $x+y \geq 3$, $x \geq 0$, $y \geq 0$
7. Minimize $z= 6x+21y$ subject to $x+2y \geq 3$, $x+ 4y \geq 4$, $3x+y \geq 3$, $x \geq 0$, $y \geq 0$ show that the minimum value of z occurs at more than two points

8. minimize $z = 2x+4y$ is subjected to $2x+y \geq 3$, $x+2y \geq 6$, $x \geq 0$, $y \geq 0$ show that the minimum value of z occurs at more than two points
9. Maximize $z=-x+2y$ subjected to constraints $x+y \geq 5$, $x \geq 3$, $x+2y \leq 6$, $y \geq 0$ is this LPP solvable? Justify your answer
10. $x-y \leq 1$, $x - y \geq 0$, $x \geq 0$, $y \geq 0$ are the constant for the objective function $z = x + y$. It is solvable for finding optimum value of z? Justify?
11. A co-operative society of farmers has 50 hectare of land to grow two crops A and B. The profit from crops A and B perpendicular hectare are estimated as Rs. 10,500 and RS. 9,000 respectively. To control weeds a liquid herbicide has to be used for crops A and B at rates of 20 liter and 10 liter per hectare. Further no more than 800 liter of herbicide should be used in order to protect fish and a wild life using the pond which collects draining from this land. How much land should be allocated to each crop so as to maximize the total profit of the society ?
12. A chemical company produces a chemical containing three basic elements A, B, C so that it has at least 16 liters of A, 24 liters of B and 18 liters of C. This chemical is made by mixing two compounds. Each unit of compound I contains 4 liters of A, 12 liters of B, 2 liters of C. and compound II coantains 2 liters of A, 2 liters of B and 6 liters of C. The cost per unit of compound I is Rs. 800/- and that of compound II is Rs. 640/- Formulate the problem as L.P.P. and solve it to minimize the cost.
13. A carpenter makes tables and chairs. Profit per table is Rs. 200 and that per chair is Rs. 100. He should make at least two chairs per table and the total number of tables and chairs should not exceed 30. Find the maximum profit.