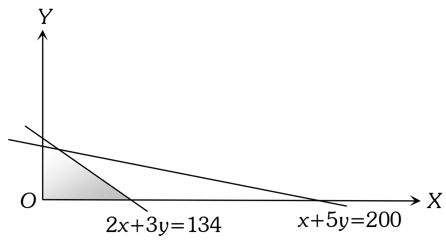
EXERCISE-I

1. The minimum value of objective function $c = 2x + 2y$ in the given feasible region, is



(A) 134 (B) 40

(C) 38 (D) 80

2. The minimum value of linear objective function $c = 2x + 2y$ under linear constraints $3x + 2y \geq 12$, $x + 3y \geq 11$ and $x, y \geq 0$, is

(A) 10 (B) 12

(C) 6 (D) 5

3. The solution for minimizing the function $z = x + y$ under a L.P.P. with constraints $x + y \geq 1$, $x + 2y \leq 10$, $y \leq 4$ and $x, y \geq 0$, is

(A) $x = 0, y = 0, z = 0$

(B) $x = 3, y = 3, z = 6$

(C) There are infinitely solutions

(D) None of these

4. The solution of a problem to maximize the objective function $z = x + 2y$ under the constraints $x - y \leq 2$, $x + y \leq 4$ and $x, y \geq 0$, is

(A) $x = 0, y = 4, z = 8$

(B) $x = 1, y = 2, z = 5$

(C) $x = 1, y = 4, z = 9$

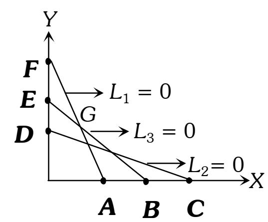
(D) $x = 0, y = 3, z = 6$

5. To maximize the objective function $z = 2x + 3y$ under the constraints $x + y \leq 30$, $x - y \geq 0$, $y \leq 12$, $x \leq 20$, $y \geq 3$ and $x, y \geq 0$

(A) $x = 12, y = 18$ (B) $x = 18, y = 12$

(C) $x = 12, y = 12$ (D) $x = 20, y = 10$

6. The feasible region for the following constraints $L_1 \leq 0, L_2 \geq 0, L_3 = 0, x \geq 0, y \geq 0$ in the diagram shown is



(A) Area *DHF*

(B) Area *AHC*

(C) Line segment *EG*

(D) Line segment *GI*

7. A wholesale merchant wants to start the business of cereal with *Rs*. 24000. Wheat is *Rs*. 400 per *quintal* and rice is Rs. 600 per *quintal*. He has capacity to store 200 *quintal* cereal. He earns the profit *Rs*. 25 per *quintal* on wheat and *Rs*. 40 per *quintal* on rice. If he stores *x quintal* rice and *y quintal* wheat, then for maximum profit the objective function is

(A) $25x + 40y$

(B) $40x + 25y$

(C) $400x + 600y$

(D) $\frac{400}{40}x + \frac{600}{25}y$

8. Mohan wants to invest the total amount of *Rs*. 15,000 in saving certificates and national saving bonds. According to rules, he has to invest at least *Rs*. 2000 in saving certificates and *Rs*. 2500 in national saving bonds. The interest rate is 8% on saving certificate and 10% on national saving bonds per annum. He invest *Rs*. *x* in saving certificates and *Rs*. *y* in national saving bonds. Then the objective function for this problem is

(A) $0.08x + 0.10y$ (B) $\frac{x}{2000} + \frac{y}{2500}$

(C) $2000x + 2500y$ (D) $\frac{x}{8} + \frac{y}{10}$

9. A firm produces two types of products *A* and *B*. The profit on both is *Rs*. 2 per item. Every product requires processing on machines M_1 and M_2. For *A*, machines M_1 and M_2 takes 1 *minute* and 2 *minute* respectively and for *B*, machines M_1 and M_2 takes the time 1 *minute* each. The machines M_1, M_2 are not available more than 8 *hours* and 10 *hours*, any of day, respectively. If the products made *x* of *A* and *y* of *B*, then the linear constraints for the L.P.P. except $x \ge 0, y \ge 0$, are

(A) $x + y \le 480$, $2x + y \le 600$

(B) $x + y \le 8$, $2x + y \le 10$

(C) $x + y \ge 480$, $2x + y \ge 600$

(D) $x + y \le 8$, $2x + y \ge 10$

10. The objective function in the above question is

(A) $2x + y$ (B) $x + 2y$

(C) $2x + 2y$ (D) $8x + 10y$

11. The point at which the maximum value of $(x + y)$ subject to the constraints $2x + 5y \le 100$, $\frac{x}{25} + \frac{y}{49} \le 1$, $x, y \ge 0$ is obtained, is

(A) (10, 20) (B) (20, 10)

(C) (15, 15) (D) $\left(\frac{50}{3}, \frac{40}{3}\right)$

12. The maximum value of $(x + 2y)$ under the constraints $2x + 3y \le 6, x + 4y \le 4, x, y \ge 0$ is

(A) 3 (B) 3.2

(C) 2 (D) 4

13. The maximum value of $10x + 5y$ under the constraints $3x + y \le 15, x + 2y \le 8$, $x, y \ge 0$ is

(A) 20 (B) 50

(C) 53 (D) 70

14. The point at which the maximum value of $(x + y)$, subject to the constraints $x + 2y \le 70, 2x + y \le 95$, $x, y \ge 0$ is obtained, is

(A) (30, 25) (B) (20, 35)

(C) (35, 20) (D) (40, 15)

15. If $3x_1 + 5x_2 \le 15$, $5x_1 + 2x_2 \le 10$, $x_1, x_2 \ge 0$ then the maximum value of $5x_1 + 3x_2$, by graphical method is

(A) $12\frac{7}{19}$

(B) $12\frac{1}{7}$

(C) $12\frac{3}{5}$

(D) 12

16. A shopkeeper wants to purchase two articles *A* and *B* of cost price *Rs*. 4 and 3 respectively. He thought that he may earn 30 *paise* by selling article *A* and 10 *paise* by selling article *B*. He has not to purchase total article worth more than *Rs*. 24. If he purchases the number of articles of *A* and *B*, *x* and *y* respectively, then linear constraints are

(A) $x \ge 0, y \ge 0, 4x + 3y \le 24$

(B) $x \ge 0, y \ge 0, 30x + 10y \le 24$

(C) $x \ge 0, y \ge 0, 4x + 3y \ge 24$

(D) $x \ge 0, y \ge 0, 30x + 40y \ge 24$

17. In the above question the iso-profit line is

(A) $3x + y = 30$ (B) $x + 3y = 20$

(C) $3x - y = 20$ (D) $4x + 3y = 24$

18. The sum of two positive integers is at most 5. The difference between two times of second number and first number is at most 4. If the first number is *x* and second number *y*, then for maximizing the product of these two numbers, the mathematical formulation is

(A) $x + y \ge 5$, $2y - x \ge 4$, $x \ge 0, y \ge 0$

(B) $x + y \ge 5$, $-2x + y \ge 4$, $x \ge 0, y \ge 0$

(C) $x + y \le 5$, $2y - x \le 4$, $x \ge 0, y \ge 0$

(D) None of these

19. For the L.P. problem $Max\, z = 3x_1 + 2x_2$ such that $2x_1 - x_2 \ge 2$, $x_1 + 2x_2 \le 8$ and $x_1, x_2 \ge 0$, $z =$

(A) 12 (B) 24

(C) 36 (D) 40

20. For the L.P. problem $Min\, z = -x_1 + 2x_2$ such that
$-x_1 + 3x_2 \le 0, x_1 + x_2 \le 6, x_1 - x_2 \le 2$
and $x_1, x_2 \ge 0$, $x_1 =$

(A) 2 (B) 8

(C) 10 (D) 12

21. The region represented by the inequation system $x, y \ge 0$, $y \le 6, x + y \le 3$, is

(A) Unbounded in first quadrant

(B) Unbounded in first and second quadrants

(C) Bounded in first quadrant

(D) None of these

22. The solution set of the inequation $2x + y > 5$, is

(A) Half plane that contains the origin

(B) Open half plane not containing the origin

(C) Whole *xy*-plane except the points lying on the line $2x + y = 5$

(D) None of these

23. If a point (*h*, *k*) satisfies an inequation $ax + by \ge 4$, then the half plane represented by the inequation is

(A) The half plane containing the point (*h,k*) but excluding the points on $ax + by = 4$

(B) The half plane containing the point (*h, k*) and the points on $ax + by = 4$

(C) Whole *xy*-plane

(D) None of these

24. Inequation $y - x \le 0$ represents

(A) The half plane that contains the positive *x*-axis

(B) Closed half plane above the line $y = x$ which contains positive *y*-axis

(C) Half plane that contains the negative *x*-axis

(D) None of these

25. Objective function of a L.P.P. is

(A) A constraint

(B) A function to be optimized

(C) A relation between the variables

(D) None of these

26. In a test of Mathematics, there are two types of questions to be answered–short answered and long answered. The relevant data is given below

Type of questions	**Time taken to solve**	**Marks**	**Number of questions**
Short answered questions	5 *minute*	3	10
Long answered questions	10 *minute*	5	14

The total marks is 100. Students can solve all the questions. To secure maximum marks, a student solves *x* short answered and *y* long answered questions in three hours, then the linear constraints except $x \geq 0, y \geq 0$, are

(A) $5x + 10y \leq 180$, $x \leq 10, y \leq 14$

(B) $x + 10y \geq 180$, $x \leq 10, y \leq 14$

(C) $5x + 10y \geq 180$, $x \geq 10, y \geq 14$

(D) $5x + 10y \leq 180$, $x \geq 10, y \geq 14$

27. The objective function for the above question is

(A) $10x + 14y$ (B) $5x + 10y$

(C) $3x + 5y$ (D) $5y + 3x$

28. The vertices of a feasible region of the above question are

(A) (0, 18), (36, 0)

(B) (0, 18), (10, 13)

(C) (10, 13), (8, 14)

(D) (10, 13), (8, 14), (12, 12)

29. The maximum value of objective function in the above question is

(A) 100 (B) 92

(C) 95 (D) 94

30. A factory produces two products *A* and *B*. In the manufacturing of product A, the machine and the carpenter requires 3 *hour* each and in manufacturing of product *B*, the machine and carpenter requires 5 *hour* and 3 *hour* respectively. The machine and carpenter work at most 80 *hour* and 50 *hour* per week respectively. The profit on *A* and *B* is *Rs*. 6 and 8 respectively. If profit is maximum by manufacturing *x* and *y* units of *A* and *B* type product respectively, then for the function $6x + 8y$ the constraints are

(A) $x \geq 0, y \geq 0, 5x + 3y \leq 80, 3x + 2y \leq 50$

(B) $x \geq 0, y \geq 0, 3x + 5y \leq 80, 3x + 3y \leq 50$

(C) $x \geq 0, y \geq 0, 3x + 5y \geq 80, 2x + 3y \geq 50$

(D) $x \geq 0, y \geq 0, 5x + 3y \geq 80, 3x + 2y \geq 50$

31. For the constraint of a linear optimizing function $z = x_1 + x_2$, given by

$x_1 + x_2 \leq 1, 3x_1 + x_2 \geq 3$ and $x_1, x_2 \geq 0$

(A) There are two feasible regions

(B) There are infinite feasible regions

(C) There is no feasible region

(D) None of these

32. Which of the following is not a vertex of the positive region bounded by the inequalities $2x + 3y \leq 6$, $5x + 3y \leq 15$ and $x, y \geq 0$

(A) (0, 2) (B) (0, 0)

(C) (3, 0) (D) None of these

33. The intermediate solutions of constraints must be checked by substituting them back into

(A) Objective function

(B) Constraint equations

(C) Not required

(D) None of these

34. For the constraints of a L.P. problem given by

$x_1 + 2x_2 \leq 2000, x_1 + x_2 \leq 1500$,

$x_2 \leq 600$ and $x_1, x_2 \geq 0$, which one of the following points does not lie in the positive bounded region

(A) (1000, 0) (B) (0, 500)

(C) (2, 0) (D) (2000, 0)

35. A basic solution is called non-degenerate, if

(A) All the basic variables are zero

(B) None of the basic variables is zero

(C) At least one of the basic variables is zero

D) None of these

36. In which quadrant, the bounded region for inequations $x + y \leq 1$ and $x - y \leq 1$ is situated

(A) I, II

(B) I, III

(C) II, III

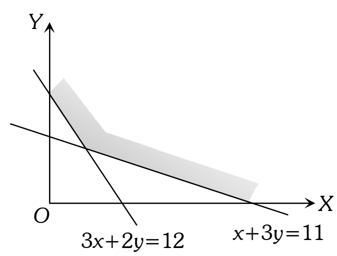
(D) All the four quadrants

37. The necessary condition for third quadrant region in xy-plane, is

(A) $x > 0, y < 0$ (B) $x < 0, y < 0$

(C) $x < 0, y > 0$ (D) $x < 0, y = 0$

38. For the following feasible region, the linear constraints are



(A) $x \geq 0, y \geq 0, 3x + 2y \geq 12, x + 3y \geq 11$

(B) $x \geq 0, y \geq 0, 3x + 2y \leq 12, x + 3y \geq 11$

(C) $x \geq 0, y \geq 0, 3x + 2y \leq 12, x + 3y \leq 11$

(D) None of these

39. The value of objective function is maximum under linear constraints

(A) At the centre of feasible region

(B) At (0, 0)

(C) At any vertex of feasible region

(D) The vertex which is at maximum distance from (0, 0)

40. The region represented by $2x + 3y - 5 \leq 0$ and $4x - 3y + 2 \leq 0$, is

(A) Not in first quadrant

(B) Bounded in first quadrant

(C) Unbounded in first quadrant

(D) None of these

41. The constraints

$-x_1 + x_2 \leq 1$

$-x_1 + 3x_2 \leq 9$

$x_1, x_2 \geq 0$ define on

(A) Bounded feasible space

(B) Unbounded feasible space

(C) Both bounded and unbounded feasible space

(D) None of these

42. Which of the following is not true for linear programming problems

(A) A slack variable is a variable added to the left hand side of a less than or equal to constraint to convert it into an equality

(B) A surplus variable is a variable subtracted from the left hand side of a greater than or equal to constraint to convert it into an equality

(C) A basic solution which is also in the feasible region is called a basic feasible solution

(D) A column in the simplex tableau that contains all of the variables in the solution is called pivot or key column

43. Which of the terms is not used in a linear programming problem
(A) Slack variables
(B) Objective function
(C) Concave region
(D) Feasible solution

44. The graph of inequations $x \le y$ and $y \le x + 3$ is located in
(A) II quadrant
(B) I, II quadrants
(C) I, II, III quadrants
(D) II, III, IV quadrants

45. The area of the feasible region for the following constraints $3y + x \ge 3, x \ge 0, y \ge 0$ will be
(A) Bounded (B) Unbounded
(C) Convex (D) Concave

46. If the number of available constraints is 3 and the number of parameters to be optimized is 4, then
(A) The objective function can be optimized
(B) The constraints are short in number
(C) The solution is problem oriented
(D) None of these

47. The solution of set of constraints $x + 2y \ge 11$, $3x + 4y \le 30,\ 2x + 5y \le 30, x \ge 0,\ y \ge 0$ includes the point
(A) (2, 3) (B) (3, 2)
(C) (3, 4) (D) (4, 3)

48. The graph of $x \le 2$ and $y \ge 2$ will be situated in the
(A) First and second quadrant
(B) Second and third quadrant
(C) First and third quadrant
(D) Third and fourth quadrant

49. The feasible solution of a L.P.P. belongs to
(A) First and second quadrant
(B) First and third quadrant
(C) Second quadrant
(D) Only first quadrant

50. The position of points O (0,0) and P (2,– 2) in the region of graph of inequation $2x - 3y < 5$, will be
(A) *O* inside and *P* outside
(B) *O* and *P* both inside
(C) *O* and *P* both outside
(D) *O* outside and *P* inside

51. The maximum value of $z = 5x + 2y$, subject to the constraints $x + y \le 7, x + 2y \le 10$, $x, y \ge 0$ is
(A) 10 (B) 26
(C) 35 (D) 70

52. The maximum value of $z = 3x + 4y$ subject to the constraints $x + y \le 40, x + 2y \le 60, x \ge 0$ and $y \ge 0$ is
(A) 120 (B) 140
(C) 100 (D) 160

53. The minimum value of $z = 2x_1 + 3x_2$ subject to the constraints $2x_1 + 7x_2 \ge 22$, $x_1 + x_2 \ge 6$, $5x_1 + x_2 \ge 10$ and $x_1, x_2 \ge 0$ is
(A) 14 (B) 20
(C) 10 (D) 16

54. The co-ordinates of the point for minimum value of $z = 7x - 8y$ subject to the conditions $x + y - 20 \le 0$, $y \ge 5$, $x \ge 0$, $y \ge 0$ is
(A) (20, 0) (B) (15, 5)
(C) (0, 5) (D) (0, 20)

55. The maximum value of $\mu = 3x + 4y$, subject to the conditions $x + y \le 40, x + 2y \le 60, x, y \ge 0$ is

(A) 130 (B) 120
(C) 40 (D) 140

56. The optimal value of the objective function is attained at the points

(A) Given by intersection of inequations with axes only
(B) Given by intersection of inequations with *x*-axis only
(C) Given by corner points of the feasible region
(D) None of these

57. The objective function $z = 4x + 3y$ can be maximized subjected to the constraints $3x + 4y \le 24$, $8x + 6y \le 48$, $x \le 5, y \le 6;\ x, y \ge 0$

(A) At only one point
(B) At two points only
(C) At an infinite number of points
(D) None of these

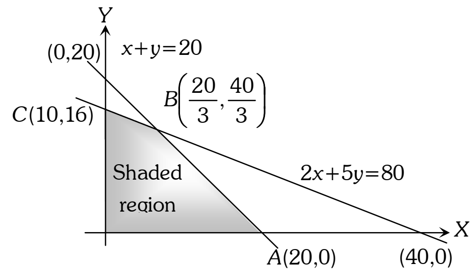
58. If the constraints in a linear programming problem are changed

(A) The problem is to be re-evaluated
(B) Solution is not defined
(C) The objective function has to be modified
(D) The change in constraints is ignored

59. Which of the following statements is correct

(A) Every L.P.P. admits an optimal solution
(B) A L.P.P. admits a unique optimal solution
(C) If a L.P.P. admits two optimal solutions, it has an infinite number of optimal solutions
(D) The set of all feasible solutions of a L.P.P. is not a convex set

60. Shaded region is represented by



(A) $2x + 5y \ge 80, x + y \le 20, x \ge 0, y \le 0$
(B) $2x + 5y \ge 80, x + y \ge 20, x \ge 0, y \ge 0$
(C) $2x + 5y \le 80, x + y \le 20, x \ge 0, y \ge 0$
(D) $2x + 5y \le 80, x + y \le 20, x \le 0, y \le 0$

61. For the L.P. problem *Min* $z = x_1 + x_2$ such that $5x_1 + 10x_2 \le 0,\ x_1 + x_2 \ge 1,\ x_2 \le 4$ and $x_1, x_2 \ge 0$

(A) There is a bounded solution
(B) There is no solution
(C) There are infinite solutions
(D) None of these

62. On maximizing $z = 4x + 9y$ subject to $x + 5y \le 200, 2x + 3y \le 134$ and $x, y \ge 0$, $z =$

(A) 380 (B) 382
(C) 384 (D) None of these

63. For the L.P. problem *Min* $z = 2x + y$ subject to $5x + 10y \le 50,\ x + y \ge 1,\ y \le 4$ and $x, y \ge 0$, $z =$

(A) 0 (B) 1
(C) 2 (D) 1/2

64. For the L.P. problem *Min* $z = 2x - 10y$ subject to $x - y \ge 0,\ x - 5y \ge -5$ and $x, y \ge 0$, $z =$

(A) –10 (B) –20
(C) 0 (D) 10

65. The point at which the maximum value of $(3x + 2y)$ subject to the constraints $x + y \le 2, x \ge 0, y \ge 0$ is obtained, is

(A) (0, 0) (B) (1.5, 1.5)
(C) (2, 0) (D) (0, 2)

66. The true statement for the graph of inequations $3x + 2y \le 6$ and $6x + 4y \ge 20$, is

(A) Both graphs are disjoint
(B) Both do not contain origin
(C) Both contain point (1, 1)
(D) None of these

67. The vertex of common graph of inequalities $2x + y \ge 2$ and $x - y \le 3$, is

(A) (0, 0) (B) $\left(\frac{5}{3}, -\frac{4}{3}\right)$
(C) $\left(\frac{5}{3}, \frac{4}{3}\right)$ (D) $\left(-\frac{4}{3}, \frac{5}{3}\right)$

68. A vertex of bounded region of inequalities $x \ge 0$, $x + 2y \ge 0$ and $2x + y \le 4$, is

(A) (1, 1) (B) (0, 1)
(C) (3, 0) (D) (0, 0)

69. A vertex of the linear inequalities $2x + 3y \le 6$, $x + 4y \le 4$ and $x, y \ge 0$, is

(A) (1, 0) (B) (1, 1)
(C) $\left(\frac{12}{5}, \frac{2}{5}\right)$ (D) $\left(\frac{2}{5}, \frac{12}{5}\right)$

70. A vertex of a feasible region by the linear constraints $3x + 4y \le 18, 2x + 3y \ge 3$ and $x, y \ge 0$, is

(A) (0, 2) (B) (4.8, 0)
(C) (0, 3) (D) None of these

71. The maximum value of $P = 6x + 8y$ subject to constraints $2x + y \le 30, x + 2y \le 24$ and $x \ge 0, y \ge 0$ is

(A) 90 (B) 120
(C) 96 (D) 240

72. The maximum value of $P = x + 3y$ such that $2x + y \le 20$, $x + 2y \le 20$, $x \ge 0, y \ge 0$, is

(A) 10 (B) 60
(C) 30 (D) None of these

73. The maximum value of $z = 4x + 2y$ subject to the constraints $2x + 3y \le 18, x + y \ge 10$; $x, y \ge 0$, is

(A) 36 (B) 40
(C) 20 (D) None of these

74. By graphical method, the solution of linear programming problem

Maximize $z = 3x_1 + 5x_2$

Subject to $3x_1 + 2x_2 \le 18$, $x_1 \le 4$, $x_2 \le 6, x_1 \ge 0$, $x_2 \ge 0$ is

(A) $x_1 = 2, x_2 = 0, z = 6$
(B) $x_1 = 2, x_2 = 6, z = 36$
(C) $x_1 = 4, x_2 = 3, z = 27$
(D) $x_1 = 4, x_2 = 6, z = 42$