ASSIGNMENT SET - I

Department of Mathematics

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B.Sc Hon.(CBCS)

Mathematics: Semester-V

Paper Code: DSE1T

[Linear Programming]

Answer all the questions

1) Define fessible solution and optimal solution of an L.P.P.
2) Verify graphically the following problem has an unbounded solution

   Maximize $Z = 3x_1 + 4x_2$

   Subject to $x_1 - 3x_2 \leq 3$, $x_2 - x_1 \leq 1$, $x_1 + x_2 \geq 4$ and $x_1, x_2 \geq 0$.
3) Distinguish between extreme point and boundary point with suitable example.
4) Define convex set . give an example of a convex set in which all boundary points are vertices.
5) Write all the characteristics for the standard form of an L.P.P
6) Construct the dual of the following L.P.P

   Maximize $Z = 4x_1 + 9x_2 + 2x_3$

   Subject to $2x_1 + 3x_2 + 2x_3 \leq 7$, $3x_1 - 2x_2 + 4x_3 = 5$ and $x_1, x_2, x_3 \geq 0$.
7) Determine the convex hull of the point (0,0) , (0,1) , (1,1) , and (4,0).
8) Obtain one basic feasible solution of the system of equation

   $$x_1 + 4x_2 - x_3 = 5, \quad 2x_2 + 3x_2 + x_3 = 8$$
9) Does a basic contain a null vector? Give reasons for your answer.
10) When artificial variables are used for solving an L.P.P. by simplex method?
11) Show that the dual of the dual of an L.P.P. is the primal itself.

12) State the fundamental theorem of duality.
13) Define separating and supporting hyperplanes.
14) Under what condition an L.P.P. will have unbounded solution?
15) Prove that a hyperplane and a closed half space in E^n are unbounded closed convex sets.
16) If $x + iy$ moves on the straight line $3x + 4y + 5 = 0$, then find the minimum value of $|x + iy|$.

17) Solve the following L.P.P. by graphical method:

Minimize Z = x_1+ $2x_2$

Subject to $5x_1 + 9x_2 \leq 45$, $x_1 + x_2 \geq 2$, $x_1 \leq 4$ and $x_1, x_2 \geq 0$

18) Fond X contains 7 unit of vitamin A and 5 units of vitamin B per gram and costs 20 p/gm. Food Y contains 12 units and 15 units of A and B per gram respectively and costs 50 p/gm. The daily requirement of vitamin A and vitamin B are at least 200 units and 320 units respectively. Formulate this problems as an L.P.P to minimize the cost.

19) $x_1 = 1, x_2 = 1, x_3 = 2$ is a feasible solution of the equation

$x_1 + 2x_2 + 3x_3 = 9$

$2x_1 - x_2 + x_3 = 3$ *and* $x_1, x_2, x_3 \geq 0$

20) Reduce the feasible solution to a basic feasible solution of the above system of equation.

21) Show that the set given by X = $\{(x_1, x_2): 9x_1^2 + 16x_2^2 \leq 144\}$ is a convex set.

22) Show that if either the primal or dual problem has a finite optimal solutions , then the other problem also has a finite optional solution and the values of the values of the two objective functions are equal.

23) Solve the following L.P.P.:

Maximize Z = $2x_1 + x_2 + x_3$

Subject to $4x_1 + 6x_2 + 3x_3 \leq 8, 3x_1 - 6x_2 - 4x_3 \leq 1, 2x_1 + 3x_2 - 5x_3 \geq 4$

and $x_1, x_2, x_3 \geq 0$.

24)) i) Solve the following L.P.P. by using two phase simplex method

Maximize Z= $\boldsymbol{x_1} + \boldsymbol{x_2}$

Subject to $2x_1+4x_2 \geq 4$, $x_1 + 7x_2 \geq 7$ and $x_1, x_2 \geq 0$

ii) Show that the set of all feasible solution to an L.P.P. is a closed convex set.

25) Obtain the dual of the following L.P.P. and hence solve it

Maximize Z= $3x_1 + 4x_2$

Subject to $x_1 + 4x_2 + 2x_3 \geq 5, 3x_1 \leq 18, x_1 \leq 8, x_2 \leq 6$ and $x_1, x_2 \geq 0$.

26) i) Use big –M method to

Minimize Z= $2x_1 + 9x_2 + x_3$

Subject to $x_1 + 4x_2 + 2x_3 \geq 5, 3x_1 + x_2 + 2x_3 \geq 4$ and $x_1, x_2, x_3 \geq 0$.

ii) State complementary slackness theorem of duality.

27) i) Using simplex method, find the inverse of the following matrix

$$A=\begin{pmatrix} 3 & 4 \\ -1 & 2 \end{pmatrix}$$

ii) Show that the feasible solution $x_1 = 1, x_2 = 0, x_3 = 1$ and $x_4 = 6$ to the system

$x_1 + x_2 + x_3 = 2,\quad x_1 - x_2 + x_3 = 2,\quad 2x_1 + 3x_2 + 4 = x_4$ is not basic.

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