18U605 (Pages: 3) Name: ……..…….

Reg. No……..……

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2021

(CUCBCSS-UG)

(Regular/Supplementary/Improvement)

CC15U MAT6 E02/ CC18U MAT6 E02 - LINEAR PROGRAMMING

(Mathematics – Elective)

(2015 Admission onwards)

Time: Three Hours Maximum: 80 Marks

Section A

Answer ***all*** questions. Each question carries 1 mark.

1. Define slack variable.
2. Define convex hull of a set S.
3. When does the simplex method indicate that the LPP has unbounded solution?
4. What do you mean by an unbalanced assignment problem?
5. The original problem is usually called _____ problem.
6. Define interior of a set.
7. Give mathematical formulation of the assignment problem?
8. Let $T = (2,3)$, then closure of T is _____
9. Define loop in a transportation problem.
10. If each $u_i + v_j - c_{ij} \leq 0$, then the current basic feasible solution is _____
11. Convex hull of a line is _____
12. Define objective function.

(12 × 1 = 12 Marks)

Section B

Answer any ***nine*** questions. Each question carries 2 marks.

13. Write the standard form of a LPP.
14. Prove that a hyper plane in R^n is a convex set.
15. Prove that dual of a dual is primal.
16. Show that the intersection of the members of any family of convex sets is again a convex set.
17. Prove that in R^2, the open half plane $\{(x, y): 2x + 5y < 7\}$ is a convex set.
18. Define artificial variable
19. Explain the method for solving a maximization assignment problem?
20. Define generalized transportation problem.

21. Solve graphically:

Maximize $z = x_1 + x_2$

subject to the constraints: $x_1 + x_2 \leq 1;\ -3x_1 + x_2 \geq 3;\ x_1, x_2 \geq 0.$

22. Rewrite in standard form:

Minimize $z = 12x_1 + 5x_2$

subject to the constraints: $6x_1 + 3x_2 \leq 15;\ 7x_1 + 2x_2 \leq 14; x_1, x_2 \geq 0.$

23. Find an IBFS:

	I	II	III	
O_1	16	19	12	**14**
O_2	22	13	19	**16**
O_3	14	28	8	**12**
	10	**15**	**17**	

24. Define penalty.

(9 × 2 = 18 Marks)

Section C

Answer any ***six*** questions. Each question carries 5 marks.

25. Show that $A = \{(1,0),(0,1)\}$ and $B = \{(x,y) \in R^2 : y = \sin x\}$ are not convex.

26. Explain Big-M method.

27. Find an optimal assignment to minimize cost:

	I	II	III	IV	V
A	9	8	7	6	4
B	5	7	5	6	8
C	8	7	6	3	5
D	8	5	4	9	3
E	6	7	6	8	5

28. Solve graphically:

Minimize $z = 2x_1 + x_2$

subject to the constraints: $5x_1 + 10x_2 \leq 50;\ x_1 + x_2 \geq 1; x_2 \leq 4; x_1, x_2 \geq 0.$

29. Explain Linear Programming Problem with a suitable example.

30. What is a restrictive assignment problem? How can we tackle it?

31. Solve by algebraic method:

Maximize $z = 6x_1 - 2x_2$

subject to the constraints: $2x_1 - x_2 \leq 2;\ x_1 \leq 4; x_1, x_2 \geq 0.$

32. Use two-phase simplex method to Maximize $z = 3x_1 + 2x_2$

subject to the constraints: $2x_1 + x_2 \leq 2;\ 3x_1 + 4x_2 \geq 12$

$x_1, x_2 \geq 0.$

33. Find the dual of the LPP:

Maximize $z = x_1 - x_2 + 3x_3 + 2x_4$

subject to the constraints:

$x_1 + x_2 \geq -1;\ x_1 - 3x_2 - x_3 \leq 7;\ x_1 + x_3 - 3x_4 = -2; x_1, x_4 \geq 0$

x_2, x_3 unrestricted.

(6 × 5 = 30 Marks)

Section D

Answer any ***two*** questions. Each question carries 10 marks.

34. Let $A \leq R^n$ be any set. Show that the convex hull of A, is the set of all finite convex combination of vectors in A.

35. Solve the Transportation Problem

	D_1	D_2	D_3	D_4	Availability
O_1	1	2	1	4	30
O_2	4	2	5	9	50
O_3	20	40	30	10	20
Demand	20	40	30	10	100

36. Use simplex method to solve the LPP:

Minimize $Z = x_1 - 3x_2 + 2x_3$

subject to the constraints:

$3x_1 - x_2 + 2x_3 \leq 7; -2x_1 + 4x_2 \leq 12; -4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0$.

(2 × 10 = 20 Marks)

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