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SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH/APRIL 2015

(U.G.–CCSS)

Elective Course—Mathematics

MM 6B 13 (E02)—LINEAR PROGRAMMING AND GAME THEORY

(2010 Admission onwards)

Time : Three Hours | Maximum : 30 Weightage

Section A

Answer **all** *questions.*
Each question carries weight ¼.

1. Give the canonical form of a maximization LPP.

2. Is " Maximize $z = 2x_1 + 3x_2$

   subject to $x_1 + x_2 = 5$

   $5x_1 - 2x_2$ 3

   x1, x2 0

   in the standard form.

3. State True *or* False : The singleton set is convex.

4. What is the maximum number of basic solutions in a system of '*m*' linear non-homogenous equations with 'n' variables ?

5. Define a surplus variable.

6. State the optimality criterion for a basic feasible solution of a Linear Programming Problem.

7. If the primal problem has an unbounded objective function, then the dual has no feasible solution—True *or* False ?

Define "penalty" in Cham's method.

What is the maximum number of basic variables in a balanced Transportation problem with 'm' rows and 'n' columns ?

Consider a 4 x 4 Transportation Problem. Does the set of cells

$\{(1, 1), (1, 2), (3, 2), (3, 4), (4, 4), (4, 1)\}$ form a loop in it.

State True *or* False : An Assignment Problem is a special types of Transportation Problem.

non-degenerate basic feasible solution of a Transportation Problem with 'm' rows and 'n' columns Las how many zeros.

(12 x ¼ = 3 weightage)

Turn over

Section B

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

13. Reduce to the standard form :

    Minimize $z = x_1 + x_2$

    subject to $2x1 \quad x2 \quad 4$

    $3x_1 + 5x_2 \quad 1O$

    $x_1 \quad 0, x2 \; O.$

14. Define a hyperplane in the Euclidean plane.

15. State a necessary and sufficient condition for a set S to be convex in E^{n}.

16. State the Fundamental Theorem of linear programming.

17. Find the dual of

    Minimize $z = 2x_1 + 3x_2 + 4x_3$

    subject to $2x_1 + 3x_2 + 5x_3 \geq 2$

    $3x_1 + x_2 + 7x_3 = 3$

    $+ 4x_2 + 6x_3$

    $x_1, x_2 \qquad x_3$ unrestricted.

18. Name the method used to solve an LPP when surplus variables arise. Also define 'penalty'.

19. Give the matrix notation of a transportation problem.

20. Find an initial basic feasible solution by NWCR :

	D_1	D_2	D_3	D_4	Supply
O_1	11	13	17	14	250
O_2	16	18	14	10	300
O_3	21	24	13	10	400
Demand	200	225	275	250	

21. Show that a balanced Transportation problem possesses a finite feasible solution and an optimal solution always.

(9 x 1 = 9 weightage)

Section C

Answer any **five** *questions.*
Each question carries weight **2.**

22. **Solve graphically :**

    Maximize $z = x_i + x_2$

    subject to $2x_1 + 3x_2 \; 6$

    $-x_2 \; 1$

    $x_1, x_2 \; 0.$

23. **Show that the set of all feasible solutions of a system of equations** $A_x = b$ **is a closed convex set.**

24. **Solve by simplex method :**

    Maximize $z = x_1 + 5x_2$

    subject to $+ 10x_2 \; 20$

    $x_1 < 2$

    $x_1, x_2 \quad 0$

25. **Solve**

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

    subject to $2x_1 + x_2 + x_3 \; 2$

    $3x_1 + 4x_2 + 2x_3 \geq 8$

    $x_1, x_2, x_3 \quad .$

26. **Show that the dual of the dual is the primal itself.**

27. **Find an initial basic feasible solution by VAM :**

	D_1	D_2	D_3	Supply
O_1	3	5	7	150
O_2	6	4	10	200
O_3	8	10	3	100
Demand	100	300	50	

28. Solve the following AP 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

(5 x 2 = 10 weighta

Section C

Answer any two questions.
Each question carries weight 4.

29. Formulate as an LPP and solve : Two types of cloth X and Y are made by a company. Each go through processes A and B. Time in hours per unit and total time available are :

	X	Y	Total hours
Process A .	3	4	24
Process B ..	9	4	36

Profit per unit of X and Y are Rs. 5 and Rs. 6 respectively how many units of X and Y sho produced to maximize profit ?

30. Use Principle of Duality to solve :

Maximize $z = 3x_1 + 2x_2$

subject to $x_1 + x_2$ **1**

• $+ X2$ 7

• $+ 2x_2$ **10**

X2 3

Xi, X2, X3, X4 0.

31. Solve the following minimization Transportation Problem :

			D_3	Supply
O_1	2	7		5
O_2	3	3	1	8
O_3	**5**	**4**	**7**	7
O_4	1	6	2	14
Demand	7	9	18	

(2 x 4 8 weightag