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Name.....

Reg. No..... 41

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 $x_1 + x_2 = 5$
   $5x_1 - 2x_2 \geq 3$
   $x_1, x_2 \geq 0$

   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 ?
8. Define "penalty" in Cham's method.
9. What is the maximum number of basic variables in a balanced Transportation problem with 'm' rows and 'n' columns ?
10. Consider a 4×4 Transportation Problem. Does the set of cells $\{(1,1),(1,2),(3,2),(3,4),(4,4),(4,1)\}$ form a loop in it.
11. State True *or* False : An Assignment Problem is a special types of Transportation Problem.
12. A non-degenerate basic feasible solution of a Transportation Problem with 'm' rows and 'n' columns has how many zeros.

($12 \times ¼ = 3$ 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 $2x_1 - x_2 \leq 4$
$3x_1 + 5x_2 \geq 10$
$x_1 \geq 0, x_2 \geq 0.$

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 $2x_1 + 3x_2 + 5x_3 \geq 2$
$3x_1 + x_2 + 7x_3 = 3$
$x_1 + 4x_2 + 6x_3 \leq 5$
$x_1, x_2 \geq 0, x_3$ 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 opti solution always.

($9 \times 1 = 9$ weight

Section C

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

22. Solve graphically :

Maximize $z = x_1 + x_2$

subject to $2x_1 + 3x_2 \leq 6$
$x_1 - x_2 \leq 1$
$x_1, x_2 \geq 0.$

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 $x_1 + 10x_2 \leq 20$
$x_1 \leq 2$
$x_1, x_2 \geq 0.$

25. Solve

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

subject to $2x_1 + x_2 + x_3 \leq 2$
$3x_1 + 4x_2 + 2x_3 \geq 8$
$x_1, x_2, x_3 \geq 0.$

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 × 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 ha 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 should produced to maximize profit ?

30. Use Principle of Duality to solve :

Maximize $z = 3x_1 + 2x_2$

subject to $x_1 + x_2 \geq 1$

$x_1 + x_2 \leq 7$

$x_1 + 2x_2 \leq 10$

$x_2 \leq 3$

$x_1, x_2, x_3, x_4 \geq 0.$

31. Solve the following minimization Transportation Problem :

	D_1	D_2	D_3	Supply
O_1	2	7	4	5
O_2	3	3	1	8
O_3	5	4	7	7
O_4	1	6	2	14
Demand	7	9	18	

(2 × 4 = 8 weighta