Reg. No.....

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 $\frac{1}{4}$.

- 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 x_1, x_2 O

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.

 $(12 \text{ x} \ 4 = 3 \text{ weightage})$

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
$$2x1 \times 2^{4}$$

 $3x_{1} + 5x_{2} 1O$
 $x_{1} 0, \times 20.$

- 14. Define a hyperplane in the Euclidean plane.
- 15. State a necessary and sufficient condition for a set S to be convex in $\mathbf{E}^{\mathbf{n}}$.
- 16. State the Fundamental Theorem of linear programming.
- 17. Find the dual of

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

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

 $3x_1 + x_2 + 7x_3 = 3$
 $+ 4x_2 + 6x_3$
 x_1, x_2 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 :

_		$\mathbf{D_1}$	\mathbf{D}_2	\mathbf{D}_3	\mathbf{D}_4	Supply
	O_1	11	13	17	14	250
	O ₂	16	18	14	10	300
	O ₃	21	24	13	10	400
Dem	and	200	225	275	250	

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

 $(9 \ge 1 = 9 \text{ weightage})$

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 -X2 **1** x1, **x2 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 $z = x_1 + 5x_2$

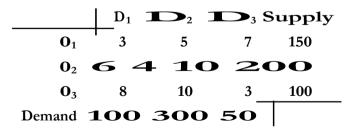
subject to $\begin{array}{c} +10x_2 \ \mathbf{20}\\ x_1 < 2\\ x_1, x_2 \ 0 \end{array}$

25. Solve

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

subject to
$$2x_1 + x_2 + x_3$$
 2
 $3x_1 + 4x_2 + 2x_3 \ge 8$
 x_1, x_2, x_3 .

- 26. Show that the dual of the dual is the primal itself.
- 27. Find an initial basic feasible solution by VAM :



28. Solve the following AP to minimize cost :

	Ι	II	III	IV	V
А	9	8	7	6	4
В	5	7	5	6	8
С	8	7	6	3	5
D	8	5	4	9	3
\mathbf{E}	6	7	6	8	5



 $(5 \ge 2 = 10 \text{ weighta})$

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 :

	Х	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

• + x_2 7

• + 2x_2 10

x2 3

xi, x2, x3, x4 0.
```

31. Solve the following minimization Transportation Problem :

			D_3 S	Supply	at BSNL un enable yo .)
O_1	2	7		5	Phone S€
O_2	3	3	1	8	an offer where yc
O ₃	5	4	7	7	' Stay in to'
O_4	1	6	2	14	through aling your o
Demand	7	9	18		- Stay in