RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [BATCH 2015-18]
B.A./B.Sc. FOURTH SEMESTER (January – June) 2017
Mid-Semester Examination, March 2017

Date : 17/03/2017

MATH FOR ECO (General)

Time : 12 noon – 1 pm

Paper : IV

Full Marks : 25

[Use a separate Answer Book for each Group]

Group – A

1. Define Geometric multiplicity of an Eigen Value. [1]

Answer any two questions from Question nos. 2 to 4 : [2×4·5]

2. Define eigen vector of a matrix. Diagonalise $A=\begin{bmatrix}1 & -1 & 0\\ 1 & 2 & -1\\ 3 & 2 & -2\end{bmatrix}$.

3. Verify Cayley Hamilton's theorem for $A=\begin{bmatrix}2 & 2 & 5\\ 1 & 3 & 2\\ 2 & 1 & 6\end{bmatrix}$.

4. Diagonalise the matrix $A=\begin{bmatrix}2 & -2 & 3\\ -2 & 1 & -2\\ 3 & -2 & 5\end{bmatrix}$ orthogonally.

Group – B

Answer any two questions from Question nos. 5 to 7 : [2×5]

5. a) A businessman has the option of investing his money in two plans. Plan A guarantees that each rupee invested will earn seventy paise a year hence, while plan B guarantees that each rupee invested will earn two rupees two years hence. In plan B, only investments for periods that are multiples of two years are allowed. The problem is how should he invest ten thousand rupees in order to maximize the earnings at the end of three years.
   Formulate this problem as a linear programming model. [3]
   b) Define basis with example. [2]

6. a) What do you mean by Degenerate solutions? [1]
   b) Reduce the following minimization problem to a maximization problem in it's standard form. [4]
   Minimize $z=3x_1-2x_2+4x_3$
   Subject to $x_1-x_2+3x_3\le 1$,
   $|2x_1+3x_2-5x_3|\ge -3$,
   $4x_1+2x_2\ge 2$,
   $x_1,x_3\ge 0$ and x_2 is unrestricted in sign.

7. a) Solve the following L.P.P. graphically. [2·5]

Maximize $z = 3x_1 + 4x_2$

Subject to $x_1 - x_2 \geq 0,$

$-x_1 + 3x_2 \leq 3,$

and $x_1, x_2 \geq 0.$

b) The following incomplete table represents the second stage in the solution of an L.P.P. by the simplex method. All variables corresponding to zero co-efficients of the objective function are slack variables. Complete the table. (The notations have their usual meanings). [2·5]

			$C_j \rightarrow$	0					0	0	0
C_B	B	X_B	b	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8
	a_6	x_6	9	13		1	–1	9			3
	a_7	x_7	4	–2		0	4	1			–1
	a_2	x_2	2	4		0	–1	1			1
$Z_j - C_j \rightarrow$				15		2	–7	5			4

Answer <u>any one</u> question from <u>Question nos. 8 & 9</u> : [1×5]

8. You are a duopolist producer of a homogeneous good. Both you and your competitor has zero marginal costs. The market demand curve is $P = 30 - Q$ where $Q = Q_1 + Q_2$ (Q_1 is your output and Q_2 is your competitor's output). You and your competitor must announce the outputs at the same time. Derive the equations of reaction functions and the optimal production levels of both of you.

9. Explain the process of attaining an equilibrium by the process of iterated elimination of strictly dominated strategies for the following game :

		Player 2		
		L	C	R
Player 1	U	0, 2	3, 1	2, 3
	M	1, 4	2, 1	4, 1
	D	2, 1	4, 4	3, 2

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