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RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

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MATH FOR ECONOMICS (General)

Paper : IV

: 27/03/2019 Date Time : 1 pm – 2 pm

[Use a separate Answer Book <u>for each group</u>]

<u>Group – A</u>

Answer any two questions :

Let $T: P_2(\mathbb{R}) \to P_3(\mathbb{R})$ be a linear transformation defined by $T(f(x)) = 2f'(x) + \int_{0}^{\infty} f(t) dt$. 1.

Determine $[T]_{\beta}^{\gamma}$ where β and λ are two standard basis of $P_2(\mathbb{R})$ and $P_3(\mathbb{R})$.

[Here $P_n(\mathbb{R})$ refers to vector space of polynomials of degree n]

2. A be a 3×3 real matrix having the eigen values 5,2,2. The eigen vectors of A corresponding to the eigen value 5 and 2 are -

$$c\begin{pmatrix}1\\1\\2\end{pmatrix}, c \neq 0 \text{ and } c\begin{pmatrix}1\\0\\-1\end{pmatrix}+d\begin{pmatrix}0\\1\\-1\end{pmatrix}, (c,d)\neq (0,0) \text{ respectively.}$$

Find the matrix A.

a) An idempotent matrix is a matrix, which, when multiplied by itself, yields itself. 3.

If λ is an eigen value of an n×n idempotent matrix A, prove that λ is either 1 or 0.

b) If λ be an eigen value of an n×n matrix A, prove that λ^3 is an eigen value of the matrix A³. [3+2]

Let $A = \begin{bmatrix} 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$. Find the eigen values of A and also its algebraic and geometric multiplicities. [2+3] 4.

[Here A is a Complex matrix.]

Group – B

	An	swer any two questions from question nos. 5 to 8:	[2×5]
5.	a)	Define Basic feasible solution.	[1]
	b)	Find all the basic solutions of the system	[3+1]
		$2x_1 + x_2 + 4x_3 = 11$	
		$3x_1 + x_2 + 5x_3 = 14$. If $x_1, x_2, x_3 \ge 0$, which of these solutions are basic feasible solutions.	
6.	a)	Define slack and surplus variable.	[1+1]

[2×5]

Full Marks : 25

[5]

[5]

b) Rewrite the following L.P.P. in its standard form with non-negative variables. Max $z = 3x_1 + 2x_2$ subject to $3x_1 + 2x_2 \le 6$

 $x_1 - x_2 \ge -1$ $-x_1 - 2x_2 \ge 1$ $x_1, x_2 \ge 0$

7. Solve the following L.P.P graphically Minimize $z = 20x_1 + 10x_2$ subject to $x_1 + 2x_2 \le 40$

$$3x_1 + x_2 \ge 30$$
$$4x_1 + 3x_2 \ge 60$$
$$x_1, x_2 \ge 0$$

Also show the feasible region for the problem.

Food X contains 5 units of Vitamin A and 6 units of vitamin B per gram and cost 20p/gram.
Food Y contains 8 units of vitamin A and 10 units of vitamin B per gram and conts 30 p/gram.
The daily requirements of A and B are at least 80 and 100 units. respectively. Formulate the above as a linear programming problem to minimize the cost. [5]

Answer **any one** question from question nos. 9 & 10:

9. Find whether you can reach the equilibrium of the following game through iterated elimination of strictly dominated strategies:

		Player 2	
	A_2	B_2	C_2
A_1	1,1	2,1	4,1
Player 1 B ₁	1,2	5,5	3,6
C_1	1,4	6,3	0,0

Find the Nash Equilibrium of the game.

10. Find the subgames of the following game:



[3+2]

[3+2]

[4+1]

(2)

Χ-

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[3]