Code: R7100204

R7

B.Tech I Year (R07) Supplementary Examinations, June 2013

MATHEMATICAL METHODS
(Common to EEE, ECE, ME, CSE, EIE, IT, E.Con.E, ECC and CSS)

Time: 3 hours   Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1 (a) Find the rank of:

$$A = \begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$$ by reducing into Echlon form.

   (b) Solve the system of equations:
$$x + 3y - 2z = 0$$
$$2x - y + 4z = 0$$
$$x - 11y + 14z = 0$$

2 (a) Prove that Eigen values of Hermitian matrix are real.
   (b) Find the Eigen values and Eigen vectors of matrix:

$$A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$$

3   Reduce the quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4zx$. To canonical form by orthogonal transformation. And hence find its rank, index and signature.

4 (a) Find a real roof of $xe^x = 2$ using Regula Falsi method.
   (b) Use Lagrange's interpolation formula, find the value of $f(3)$ from the following table.

x:	0	1	2	4	5	6
$f(x)$:	1	14	15	5	6	19

5 (a) Fit a parabola of the form, $y = a + bx + cx^2$ to the following data:

x	1	2	3	4	5	6	7
y	23	5.2	9.7	16.5	29.4	35.5	54.4

   (b) The population of a certain town is shown in the following table. Find the rate of growth of the population in 1981:

year (x)	1951	1961	1971	1981	1991
population (y)	40.62	60.80	79.95	103.56	132.65

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6   Using $R - k$ method, find $y(0.2)$, $y(0.4)$ for the equation $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2} 1 y(0) = 1$ taking $h = 0.1$.

7   (a)   Find the Fourier series for the function:

        $f(x) = \begin{cases} x, & 0 < x < 1 \\ 1 - x, & 1 < x < 2 \end{cases}$ and hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + - - - - - \frac{\pi^2}{8}$.

   (b)   Find the Fourier cosine transform of $\frac{1}{1+x^2}$.

8   (a)   Solve $(x^2 - yz)p + (y^2 - 2x)q = z^2 - xy$.

   (b)   Solve $u_{n+2} + 3u_{n+1} + 2u_n = 0, u_0 = 0, u_1 = 1$.

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