Code: R5100204

R05

B. Tech I Year (R05) Supplementary Examinations, May 2012
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, EIE, BME, IT, E.Con.E, ECC, CSS, & ICE)

Time: 3 hours Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1 (a) Find a root of the equation $x^3 - 4x - 9 = 0$ using bisection method in four stages.
(b) Find y (1.6) using Newton's forward difference formula from the table.

x	1	1.4	1.8	2.2
Y	3.49	4.82	5.96	6.5

2 (a) Derive normal equations to fit the parabola $y = a+bx+cx^2$.
(b) Given that:

X	4.0	4.2	4.4	4.6	4.8	5.0	5.2
log (x)	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

Evaluate $\int_4^{5.2} \log x$ dx by Simpsons 3/8 rule.

3 Solve $y^1 = x-y^2$, y (0) = 1 using Taylor's series method and compute y (0.1), y (0.2), y (0.3) and y (0.4).

4 (a) Determine whether the following equations will have a non-trivial solution. If so solve them.

$$3x + 4y - z - 6w = 0; \quad 2x + 3y + 2z - 3w = 0$$
$$2x + y - 14z - 9w = 0; \quad x + 3y + 13z + 3w = 0$$

(b) Solve the tridiagonal system:
$3x_1 - x_2 = 4,$
$2x_1 - x_2 + x_3 = 6,$
$2x_2 + 3x_3 + 2x_4 = 11,$
$x_3 - 2x_4 = -1.$
By writing the coefficient matrix as a product of lower triangular and upper triangular matrices.

5 (a) Find the Eigen values and the corresponding Eigen vectors of the matrix.

$$\begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$$

(b) Verify Cayley-Hamilton theorem for the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$$

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6 (a) Prove that the matrix $\frac{1}{3}\begin{bmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ is orthogonal.

(b) Find the Eigen values and the corresponding Eigen vectors of the matrix.

$$\begin{bmatrix} 2-i & 0 & i \\ 0 & 1+i & 0 \\ i & 0 & 2-i \end{bmatrix}$$

7 (a) Obtain the Fourier series for the function f(x) = |x| in $-\pi$ <x< π and deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots \ldots\ldots = \frac{\pi^2}{8}$.

(b) State and prove shifting property of Fourier transform.

8 (a) Form the partial differential equation by eliminating the arbitrary constants from: $(x-a)^2 + (y-b)^2 + z^2 = r^2$.

(b) Solve the partial differential equation $z^2\ (p^2+q^2) = x^2 + y^2$.

(c) Find the z - transform of sin$\alpha k,\ \ k \geq 0$.

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