

B.Tech I Year (R05) Supplementary Examinations, December 2010

MATHEMATICAL METHODS

(Electrical & Electronics Engineering, Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Electronics & Computer Engineering, Computer Science & Engineering, Information Technology, Biomedical Engineering, Computer Science & Systems Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

1. (a) Find a real root of $3x - e^x = 0$ by bisection method.
(b) Find $y(54)$ from the following table using Newton's forward difference formula.

| | | | | |
|---|-----|-----|-----|-----|
| x | 50 | 60 | 70 | 80 |
| y | 205 | 225 | 248 | 274 |

2. (a) Derive normal equations to fit a straight line.
(b) Fit a straight line for the following data.

| | | | | | | |
|---|----|----|----|----|----|----|
| x | 1 | 2 | 3 | 4 | 5 | 6 |
| y | 14 | 33 | 40 | 63 | 76 | 85 |

and compute $y(3.5)$

- (c) Evaluate $\int_1^2 \frac{dx}{x}$ using Trapezoidal rule taking $h = 0.1$.

3. Using Euler modified method with $h=0.5$ first compute $y(0.5)$, $y(1)$, $y(1.5)$ given that $\frac{dy}{dx} = \frac{x+y}{2}$, $y(0) = 2$ then compute $y(2)$ using Milne's predictor corrector method.

4. (a) For what value of K the matrix

$$\begin{bmatrix} 4 & 4 & -3 & 1 \\ 1 & 1 & -1 & 0 \\ k & 2 & 2 & 2 \\ 9 & 9 & K & 3 \end{bmatrix} \text{ has rank 3.}$$

- (b) Solve the following tridiagonal system $x_1 + 2x_2 = 5$, $x_1 + 3x_2 + x_3 = 6$, $x_2 - 2x_3 + x_4 = 3$, $3x_3 - 5x_4 = 2$ by expressing the coefficient matrix as a product of a lower triangular and upper triangular matrices.

5. (a) Find the eigen values and the corresponding eigen vectors of the matrix. $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

- (b) If A and B are n rowed square matrices and if A is invertible show that $A^{-1}B$ and BA^{-1} have the same eigen values.

6. Reduce the quadratic form $8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$ to the canonical form. Find the rank, index, signature and nature.

7. (a) Expand $f(x) = x \sin x$, $0 < x < 2\pi$ as a Fourier series.

- (b) Using Fourier integral show that $\int_0^{\infty} \frac{1 - \cos \pi \lambda}{\lambda} \sin x \lambda d\lambda = \frac{\pi}{2}$ if $0 < x < \pi$
 $= 0$ if $x > \pi$

8. (a) Form the partial differential equation eliminating arbitrary function

$$2z = [\sqrt{x+a} + \sqrt{y-a}] + b$$

- (b) Find $Z(2.3^n + 5.n)$ deduce $Z[2.3^{n+3} + 5(n+3)]$ using shifting theorem
