

Code No: 51008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May - 2018

MATHEMATICAL METHODS

(Common to EEE, ECE, CSE, EIE, BME, IT)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Are the following equations consistent. If so solve them
 $x + 2y - z = 3$; $3x - y + 2z = 1$; $2x - 2y + 3z = 2$; $x - y + z = -1$.
- b) Solve completely the equations by LU decomposition:
 $x + 3y - 2z = 0$; $2x - y + 4z = 0$; $x - 11y + 14z = 0$. [7+8]
2. Verify Cayley – Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ and hence find A^{-1} . [15]
- 3.a) Define: i) Symmetric matrix ii) Skew-Symmetric matrix iii) Hermitian matrix.
 iv) Skew Hermitian matrix. Give examples.
- b) Prove that the Eigen values of a skew – Hermitian matrix are purely imaginary or zero. [8+7]
- 4.a) Find a real root of $f(x) = x^3 - x - 1 = 0$ by bisection method.
- b) The population of a town is as follows:
- | Year x | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 |
|----------------------|------|------|------|------|------|------|
| Population in Lakhs: | 20 | 24 | 29 | 36 | 46 | 51 |
- Estimate the population increase during the period of 1946 to 1976. [7+8]
- 5.a) Fit a straight line to the following data:
- | | | | | | |
|-------|---|-----|-----|-----|-----|
| x : | 0 | 1 | 2 | 3 | 4 |
| y : | 1 | 1.8 | 3.3 | 4.5 | 6.5 |
- b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with $h = 0.2$. [7+8]
6. Find $y(0.1)$, $y(0.2)$ and $y(0.3)$ given $\frac{dy}{dx} + (xy^2 + y) = 0$, $y(0) = 1$ by taking $h = 0.1$ using Runge-Kutta method. [15]

7. Find the Fourier series of $f(x) = x + x^2$, $-\Pi < x < \Pi$ and hence deduce the series.

a) $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\Pi^2}{6}$ b) $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \dots = \frac{\Pi^2}{12}$ [7+8]

8.a) Form the partial differential equation by eliminating ϕ from $lx + my + nz = \phi(x^2 + y^2 + z^2)$.

b) Solve $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$.

c) Solve $z = px + qy + p^2q^2$. [15]

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14-05-2018PM