

Code No: Z0224

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May - 2018

MATHEMATICAL METHODS

(Common to EEE, ME, ECE, CSE, IT)

Time: 3 hours

Max. Marks: 80

Answer any five questions
All questions carry equal marks

- 1.a) Find the rank of the matrix $A = \begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{bmatrix}$ by reducing it to canonical.

- b) Solve the following equations by expressing the coefficient matrix as a product of lower triangular and upper triangular matrices. $2x + y - z = 3$, $x - 2y - 2z = 1$, $x + 2y - 3z = 9$.
[8+8]

- 2.a) Find the Eigen values and the corresponding Eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

- b) Show that the matrix $A = \begin{bmatrix} 1 & -2 & 2 \\ 1 & -2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ satisfies its characteristic equation. [8+8]

- 3.a) Prove that the Eigen values of a Skew- Hermitian matrix are purely imaginary or zero.
b) Reduce the quadratic form to canonical form by an orthogonal reduction and state the nature of the quadratic form $2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx$. [8+8]

- 4.a) Find the real root of the equation $xe^x - \cos x = 0$ using Newton Raphson method.
b) Find $f(22)$ from the Gauss forward formula. [8+8]

x	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

- 5.a) Find the curve of best fit to the type $y = ae^{bx}$ to the following data by the method of least squares.

x	1	5	7	9	12
y	10	15	12	15	21

- b) A rocket is launched from the ground. Its acceleration measured every 5 seconds is tabulated below. Find the velocity and the position of the rocket at $t = 40$ seconds. Use trapezoidal rule as well as Simpson's rule. [8+8]

t	0	5	1	15	20	25	30	35	40
$a(t)$	40.0	45.25	48.50	51.25	54.35	59.48	61.5	64.3	68.7

6. Given $y' = x + \sin y$, $y(0) = 1$ compute $y(0.2)$ and $y(0.4)$ with $h = 0.2$ using Euler's modified method. [16]

7.a) Find the Fourier series of the following function $f(x) = \begin{cases} 0, & -\pi < x < 0 \\ \frac{\pi x}{4}, & 0 < x < \pi \end{cases}$

- b) Find Fourier Sine and Cosine transforms of xe^{-ax} . [8+8]

8.a) Form the partial differential equation by eliminating the arbitrary function f from $xy + yz + zx = f\left(\frac{z}{x+y}\right)$.

- b) State convolution theorem. Use convolution theorem to evaluate $z^{-1} \left\{ \frac{z^2}{(z-a)(z-b)} \right\}$. [8+8]

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