

Code No: 51008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, October/November - 2016

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) Reduce the matrix $A = \begin{bmatrix} 2 & 1 & 2 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \\ 2 & 5 & 11 & 6 \end{bmatrix}$ into Normal form hence find its rank.

b) Determine the value of λ for which the set of equations $x+y+3z = \lambda x$;
 $3x+y+2z = \lambda y$; $2x+3y+z = \lambda z$ may possess nontrivial solution and solve them. [7+8]

2.a) Prove that the Eigen values of A^{-1} are the reciprocals of the Eigen values of A.

b) Using Cayley-Hamilton theorem find the inverse of $A = \begin{bmatrix} 7 & -1 & 3 \\ 6 & 1 & 4 \\ 2 & 4 & 8 \end{bmatrix}$. [5+10]

3. Identify the nature of the quadratic form $-3x^2 - 3y^2 - 3z^2 - 2xy - 2xz + 2yz$ and reduce it to canonical form by orthogonal reduction. [15]

4.a) Solve $x = 0.21 \sin(0.5 + x)$ by using iteration method. Start with the initial solution $x = 0.12$.

b) Find the value of x when $y = 13.6$ Using Lagrange's formula [7+8]

x	30	35	40	45	50
y	15.9	14.9	14.1	13.3	12.5

5.a) For the data

x	1	2	3	4	5	6
y	1.6	4.5	13.8	40.2	125	300

find the equation to the best fitting exponential curve of the form $y = ae^{bx}$

b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's rule and trapezoidal rule and hence find the approximate value of π . [7+8]

6. If $\frac{dy}{dx} = 2e^x - y$ with $y(0) = 2$, find $y(0.1)$ and $y(0.2)$ by Picard's Method up to 4 decimals. [15]

7.a) Form the Partial differential equation by eliminating the arbitrary function from

$$z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$$

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

[7+8]

8.a) Show that for $-\pi < x < \pi$,

$$\sin ax = \frac{2 \sin a\pi}{\pi} \left(\frac{\sin x}{1^2 - a^2} - \frac{2 \sin 2x}{2^2 - a^2} + \frac{3 \sin 3x}{3^2 - a^2} - \dots \right), a \text{ is not an integer.}$$

b) Obtain the Half range cosine series for the function $f(x) = x \sin x$, $0 < x < \pi$, and

$$\text{show that } \frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \dots = \frac{\pi - 2}{4}.$$

[7+8]

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