Code No: 51008

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, May - 2016

MATHEMATICAL METHODS

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

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) Find the value of k such that the rank of A is 2.

$$\begin{bmatrix} 1 & 1 & -1 & 1 \\ 1 & -1 & k & -1 \\ 3 & 1 & 0 & 1 \end{bmatrix}$$

b) Find all the non-trivial solutions of
3x + 4y – z -6w = 0, 2x + 3y + 2z – 3w = 0, 2x +y -14 z - 9w = 0,
x + 3y + 13z +3w= 0. [7+8]

2.a) If $\lambda_1, \lambda_2, \lambda_3....\lambda_n$ are the Eigen values of a square non singular matrix, then prove that the Eigen values of A^{-1} are $\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, \frac{1}{\lambda_3}....\frac{1}{\lambda_n}$.

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

$$\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$$

[7+8]

3.a) Express the matrix A as a sum of symmetric and skew symmetric matrices, where

$$A = \begin{bmatrix} 3 & -2 & 6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}$$

b) Show that the matrix $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is orthogonal. [7+8]

4.a) Find a real root for the equation $x^3 - 4x - 9 = 0$ using Regula falsi method.

b) Using Newton's forward interpolation formula find the value of $f(1.6)$ if:

x	1	1.4	1.8	2.2
y	3.49	4.82	5.96	6.5

[7+8]

5.a) Fit the straight line

x	1	2	3	4	5
y	5	7	9	10	11

b) Evaluate by dividing the range of integration into 8 equal parts using $\int_0^1 \frac{dx}{1+x^2}$

i) Trapezoidal rule, ii) Simpson's 1/3 rd rule. [7+8]

6. Given that $\frac{dy}{dx} = 1 + xy$ and y(0)=1. Compute y(0.1) and y(0.2) using Picards method. [15]

7.a) Obtain the Fourier series for the function

$$f(x) = x + x^2 \text{ in } [-\pi, \pi]$$

Deduce that $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$.

b) Find the half range Sine series for f(x) = x in $[0, \pi]$. [7+8]

8. Solve the following partial differential equations:

a) $z(p+q) = x + y$

b) $x^2(y-z)\, p + y^2(z-x)q = z^2(x-y)$. [7+8]

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