Code: 9ABS301

R09

B.Tech II Year I Semester (R09) Supplementary Examinations, May 2013

MATHEMATICS - II

(Common to AE, BT, CE and ME)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 Show that the matrix A = $\begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$ satisfies Cayley – Hamilton theorem.

2 (a) Prove that every square matrix is uniquely expressed as the sum of a Hermitian matrix and Skew-Hermitian matrix.

(b) Find the Eigen vectors of the Hermitian matrix A = $\begin{bmatrix} a & b+ic \\ b-ic & k \end{bmatrix}$.

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

(b) Prove that in $(-\pi, \pi)$, $x\cos x = \frac{-1}{2}\sin x + 2\sum_{n=2}^{\infty}\frac{(-1)^n}{n^2-1}\sin nx$.

4 Using Fourier integral show that $e^{-ax} - e^{-bx} = \frac{2(b^2-a^2)}{\pi}\int_0^{\infty}\frac{\lambda\sin\lambda x\, d\lambda}{(\lambda^2+a^2)(\lambda^2+b^2)}, a, b, > 0$.

5 A string of length L is fastened at both ends *A* and *C*. At a distance '*b*' from the end *A*, the string is transversely displaced to a distance 'd' and is released from rest when it is in this position. Find the equation of the subsequent motion.

6 (a) Find the roots of the equation $x^3 - 4x + 1 = 0$ using Bisection method.

(b) Given x = 1, 2, 3, 4 and f(x) 1, 2, 9, 28 respectively find f(3.5) using 'Lagrange' method of 2nd and 3rd order degree polynomials.

x	1	2	3	4
f(x)	1	2	9	28

7 Find the area bounded by the curve $y = x^3 - x + 1$, x-axis between $x = 0$ and $x = 1.2$ by (i) Trapezoidal rule. (ii) Simpson $\frac{1}{3}$ rule. (iii) Simpson $\frac{3}{8}$ Rule and compare the results.

8 Employ Taylor's series method to obtain approximate value of y(1.1) and y(1.3), for the differential equation $y' = xy^{1/3}$, y(1) = 1. Compare the numerical solution obtained with exact solution.

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