B.Tech II Year I Semester (R13) Regular & Supplementary Examinations December 2015

MATHEMATICS – II

(Common to CE and ME)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define symmetric matrix and if $\begin{bmatrix} 3 & a & b \\ -2 & 2 & 4 \\ 7 & 4 & 5 \end{bmatrix}$ is symmetric, then (a, b) = ---------

(b) If A = $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & b & c \end{bmatrix}$ is orthogonal then $(|a|, |b|, |c|) =$

(c) Newton's iterative formula for finding the cube root of a number N is --------

(d) Write Lagrange's formula and find $y(1)$ from the data

x	0	2	3
y	3	1	2

(e) Find $y'(1.2)$ if $x_0 = 1.2,\ \rho = 0,\ h = 0.2,\ \Delta y_0 = 0.416,\ \Delta^2 y_0 = 0.336$ and $\Delta^3 y_0 = 0.048$.

(f) Write Milne's predictor corrector formula.

(g) The Euler's integral formula for the constants a_n for the function $f(x)$ defined in the interval $(0, 2l)$ is – – –

(h) The Fourier cosine transform of $f(x) = e^{-ax}$ $(x \geq 0, a \geq 0)$ is ------

(i) The partial differential equation of all planes whose x and y intercepts are always equal is -------

(j) The partial differential equation obtained by eliminating a and b from $z = (x^2 + a^2)(y^2 + b^2)$ is -------

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 Show that $A = \begin{bmatrix} i & 0 & 0 \\ 0 & 0 & i \\ 0 & i & 0 \end{bmatrix}$ is Skew-Hermitian and also unitary. Find its Eigen values and Eigen vectors.

OR

3 Reduce the quadratic form $x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3$ by orthogonal transformation. Find rank signature and nature.

UNIT - II

4 Find the cubic polynomial y_x which takes on the values: $y_0 = -5, y_1 = 1, y_2 = 9, y_3 = 25, y_4 = 55, y_5 = 105$. Use the difference table to calculate $y_{3.2}$.

OR

5 Fit an exponential curve of the form $y = ab^x$ for the data:

x	1	2	3	4
y	7	11	17	27

UNIT - III

6 Find the approximate area bounded by the curve $y = \sqrt{1 - x^2}$ and the x-axis by: (i) Trapezoidal rule. (ii) Simpson's 1/3 rule.

OR

7 Apply R-K 4th order method to find $y(0.1)$ where $\frac{dy}{dx} = x + y, y(0) = 1$.

UNIT - IV

8 Find the Fourier series of the function $f(x) = e^{ax}$ in $(0, 2\pi)$.

OR

9 Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2 & |x| \leq 1 \\ 0 & |x| > 1 \end{cases}$. Hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos\frac{x}{2} dx$.

UNIT - V

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

OR

11 An insulated rod of length ℓ has its ends A and B maintained at 0℃ and 100℃ respectively. Until steady state conditions prevail. If 'B' is suddenly reduced to 0℃ and maintained at 0℃, find the temperature at a distance x from A at time t.

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