Code: 13A54301 **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations November/December 2017

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) Find the rank of the matrix A = $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$.

(b) Find all the Eigen values of the matrix A = $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.

(c) Find the values of the $\Delta y_0, \Delta^2 y_0, \Delta^3 y_0$ for the given data:

x	1	2	3	4	5
y	10	26	58	112	194

(d) Applying Lagrange's formula inversely to find x when y = 6 given data.

x	20	30	40
y	2	4.4	7.9

(e) Evaluate $\int_0^6 3x^2 dx$ dividing the interval [0, 6] into six equal parts by applying Trapezoidal rule.

(f) Using Euler's method find y at x = 0.2 given $\frac{dy}{dx} = 3x + \frac{y}{2}$ *with* $y(0) = 1$ *taking* $h = 0.1$

(g) Obtain the sine half range Fourier series of $f(x) = x^2$ *in* $(0, \pi)$.

(h) Find the Fourier transform of $f(x) = e^{-|x|}$.

(i) Form the PDE by eliminating the arbitrary constants in the $z = a \log(x^2 + y^2) + b$.

(j) Form the PDE by eliminating the arbitrary function in the $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$.

PART – B

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

UNIT – I

2 Test the consistency and solve:

$5x + y + 3z = 20$

$2x + 5y + 2z = 18$

$3x + 2y + z = 14$

OR

3 Find all the Eigen values and the corresponding Eigen vectors of the matrix: A= $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

UNIT – II

4 Find the real root of the equation $x \log_{10} x = 1.2$ and hence the root correct to four decimal places.

OR

5 Fit a parabola of second degree $y = a + bx + cx^2$ for the data:

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

Contd. in page 2

UNIT – III

6 Evaluate $\int_0^1 \frac{dx}{1+x}$ taking seven ordinates by applying Simpson's 3/8th rule. Hence deduce the value of $log_e 2$.

OR

7 Use fourth order Runge-Kutta method to find y at x = 0.1 given that:

$$\frac{dy}{dx} = 3e^x + 2y,\ y(0) = 0\ and\ h = 0.1$$

UNIT – IV

8 Obtain the Fourier Series for the function x^2 in $-\pi \le x \le \pi$ and hence deuce that:

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + ... = \frac{\pi^2}{12}$$

OR

9 Find the complex Fourier transform of the function:

$$f(x) = \begin{cases} 1 & for\ \ |x| \le a \\ 0 & for\ \ |x| > a \end{cases}\quad Hence\ \ evaluate\ \int_0^\infty \frac{\sin x}{x} dx$$

UNIT – V

10 Solve $x^2 \frac{\partial u}{\partial x} + y^2 \frac{\partial u}{\partial y} = 0$ by the method of separation of variables.

OR

11 Find the numerical solution of the parabolic equations:

$\frac{\partial^2 u}{\partial x^2} = 2\frac{\partial u}{\partial t}$ $when\ u(0,t) = 0 = u(4,t)\ and\ u(x,0) = x(4-x)\ by\ taking\ h = 1.$ Find the values up to t = 5.

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