Code: 13A54301 **R13**

B.Tech II Year I Semester (R13) Regular Examinations December 2014

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) What is the Hermitian matrix with proper example?

(b) Find the rank of $\begin{bmatrix} 3 & 1 & 1 \\ 0 & 4 & 5 \\ 2 & 1 & 2 \end{bmatrix}$.

(c) State Lagrange's interpolation formula.

(d) Find f(x_1) an approximate value of the equation $x^3 + x - 1 = 0$ near x = 1 ,using the method of regular falsi.

(e) Using Taylor's series method solve the equation $\frac{dy}{dx} = -xy, \quad y(0) = 1$.

(f) What is the formula for RK fourth order formula?

(g) What is the formula for half range cosine series?

(h) Derive a partial differential equation by eliminating the arbitrary function *f* from the relation $f(x^2 + y^2, x^2 - z^2) = 0$.

(i) Find the Eigen values of A= $\begin{pmatrix} 1 & 3 \\ 4 & 5 \end{pmatrix}$

(j) Form a PDE by eliminating the constants h and k from $(x - h)^2 + (y - k)^2 + z^2 = c^2$.

PART - B

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

UNIT - I

2 If A = $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ then find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$. And also find A^{-1} .

OR

3 Reduce the quadratic form 2xy + 2xz + 2yz to a canonical form and also find its nature of the matrix.

UNIT - II

4 Find a real root of the equation $x \log_{10} x = 1.2$ by Newton Raphson method correct to five decimal places.

OR

5 From the following, estimate the number of students who obtained marks between 50 and 55:

Marks	30-40	40-50	50-60	60-70	70-80
No.of students	31	42	51	35	31

Using Newton's forward interpolation formula.

UNIT - III

6 Find the value of y for x=0.1 by Picard's method, given that $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$.

OR

7 Evaluate $\int_0^{\pi} \cos x \, dx$ by dividing the range into 6 equal parts by using:

(a) Trapezoidal rule.

(b) Simpson's $\frac{1}{3}$ rule.

Cond. in page 2

UNIT – IV

8 Expand the function f(x) = x sinx , as a Fourier series in the interval $-\pi \le x \le \pi$. Hence deduce that $\frac{1}{1.3}-\frac{1}{3.5}+\frac{1}{5.7}-\frac{1}{7.9}+..........=\frac{\pi-2}{4}$.

OR

9 Find the Fourier Transform of $f(x)=\begin{cases}1-x^2 & |x|\le 1\\ 0 & |x|\le 1.\end{cases}$ and use it to evaluate $\int_0^\infty \left(\frac{x\cos x-\sin x}{x^3}\right)\cos\frac{x}{2}\,dx$.

UNIT – V

10 Using the Method of separation of variables solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u \quad where \;\; u(x,0)=6e^{-3x}$

OR

11 Determine the solution of one dimensional heat equation $\frac{\partial u}{\partial t}=C^2\frac{\partial^2 u}{\partial t^2}$. Subject to the boundary conditions u(0,t) = 0, u(1,t)=0 (t>0) and initial conditions u(x,0) = x , 1 being the length of the bar.

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