B.Tech I Year (R13) Supplementary Examinations December/January 2014/2015

MATHEMATICS – II

(Common to EEE, ECE, EIE, CSE and IT)

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 sine series of $f(x) = k$ in $(0, \pi)$.

(b) If $f(x) = x + x^2\ in - \pi < x < \pi$ then find a_n.

(c) Obtain the complete solution for $\mathrm{p} + \mathrm{q} = \sin \mathrm{x} + \sin \mathrm{y}$.

(d) Find $a_0, f(x) = |cos\ x|, (-\pi, \pi)$.

(e) Find P.I of (D2-2DD') z = x^3 y.

(f) State one dimensional heat equation.

(g) Find the Eigen values for the matrix $\begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$.

(h) Write condition for the system AX = B is consistent.

(i) Find the rank of $\begin{bmatrix} 1 & -9 & 6 \\ 4 & 8 & 5 \\ 7 & 9 & 4 \end{bmatrix}$.

(j) Using Euler's method find the solution of the initial problem $\frac{dy}{dx} = \log(x + y), y(0) = 2$ at $x = 0.2$ by assuming h = 0.2.

PART – B

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

UNIT - I

2 Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form. Also specify the matrix of transformation.

OR

3 State and prove Cayley-Hamilton theorem.

UNIT - II

4 Find the root of $x\ log_{10}\ x - 1.2 = 0$ by Newton Raphson method corrected to three decimal places.

OR

5 Evaluate $\int_0^1 xe^x dx$ taking 4 intervals. Using (i) Trapezodial rule. (ii) Simpson's 1/3 rd rule.

UNIT - III

6 Use fourth order Runge-Kutta method to compare y for x = 0.1, given $\frac{dy}{dx} = \frac{xy}{1+x^2}, y(0) = 1$ take $h = 0.1$.

OR

7 Find the Half range Fourier sine series $f(x) = x(\pi - x) \quad 0 \le x \le \pi$ and hence deduce that: (i) $\sum \frac{1}{n^4} = \frac{\pi^4}{960}$.

$$(ii) \sum_{n=1} \frac{1}{(2n-1)^6} = \frac{\pi^6}{960}.$$

UNIT - IV

8 Find the Fourier cosine transform of $f(x) = e^{-x^2}$.

OR

9 Solve Z-transform $y_{k+1} + \frac{1}{4} y_k = \left(\frac{1}{4}\right)^k, (k \ge 0),\ y(0) = 0$.

UNIT - V

10 Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(x,0) = 3\sin(n\pi x), u(x,t) = 0, u(a,t) = 0$, where $0 < x < 1, t > 0$.

OR

11 A tightly stretched string with fixed end points $x = 0$ and $x = 1$ is initially in a position given by $y = y_0\ sin^3(\pi x/l)$. if it is selected from rest from this position, find the displacement $y(x,t)$.

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