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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 $p + q = \sin x + \sin y$.
(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 $f(x) = x(\pi - x)$ $0 \le x \le \pi$ and hence deduce that: (i) $\sum \frac{1}{n^4} = \frac{\pi^4}{960}$.

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

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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