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B.Tech I Year (R13) Regular Examinations June/July 2014

MATHEMATICS - II

(Common to EEE, ECE, EIE, CSE & 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 Fourier constant bn for $x \sin x$ in $[-\pi, \pi]$, when expressed as a Fourier series.

(b) Find the Fourier series $f(x) = e^x$ defined in $[-\pi, \pi]$.

(c) Find a_0, $f(x) = |\sin x|$, $[-\pi, \pi]$.

(d) Write the complete solution of $z = px + qy + pq$.

(e) Eliminate the arbitrary constants a and b from $z = ax + by + a^2 + b^2$.

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

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

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

(i) Apply Euler's method to solve $y' = x + y$, $y(0) = 1$, find $y(1)$.

(j) Discuss the Netwon-Raphson method for convergence.

Part – B
(Answer all five units, 05 X 10 = 50 Marks)

Unit - I

2 Using Cayley-Hamilton theorem, find the inverse of $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$ and also find A^{-3}.

OR

3 Reduce the quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4xz$ to the sum of squares form and find the index and signature.

Unit - II

4 Using Newton's forward interpolation formula, find the polynomial y = tan x satisfying the following data. Hence evaluate tan(0.12) and tan(0.28)

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2533	0.3093

OR

5 Dividing the range into 10 equal parts, find the value of $\int_0^{\pi/2} \sin x \, dx$. Using (i) Trapezoidal rule. (ii) Simpson's 1/3 rd rule.

Unit - III

6 Using Taylors series method with first five terms in the expansion find y(0.1) correct to three decimal places, given that $\frac{dy}{dx} = e^x - y^2$, $y(0) = 1$.

OR

7 Given $f(x) = f(x) = \begin{cases} -x + 1 & for \ -\pi \le x \le 0 \\ x + 1 & for \ \ 0 \le x \le \pi \end{cases}$. Is the function even or odd? Find the Fourier series for f(x) and deduce the value of $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots\ldots$

Unit - IV

8 Find the Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$.

OR

9 Find: (i) $Z[\sin(3k + 5)]$, (ii) $Z^{-1}\left[\frac{4z}{z-a}\right]$ $if \ |z| < a$.

Unit - V

10 Form partial differential equations by eliminating arbitrary constants.
(i) $Z = f(x + at) + g(x - at)$, (ii) $z = f_1(x) + f_2(y)$.

OR

11 Using the method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $U(x, 0) = 6e^{-3x}$.

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