R13

Code: 13A54102

B.Tech I Year (R13) Supplementary Examinations June 2016

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) Define the rank of a matrix with example.

(b) Show that $A = \begin{bmatrix} i & 0 & 0 \\ 0 & 0 & i \\ 0 & i & 0 \end{bmatrix}$ is a Skew-Hermitian matrix.

(c) Find the sum and product of the Eigen values of the matrix $A = \begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix}$.

(d) Prove that $\mathrm{E}\,\nabla = \Delta = \nabla\,\mathrm{E}$.

(e) Construct the difference table if $y(0) = 1,\ y(1) = 0,\ y(2) = 1\ and\ y(3) = 10$.

(f) If $y = ax + bx + cx^2$, then write the normal equations to fit the curve.

(g) Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ by Trapezoidal rule.

(h) Find the Fourier series of $f(x) = x\ \ in\ (-\pi, \pi)$.

(i) What is $F_C\,\{e^{-at}\}\ and\ F_C\,\{t\,e^{-at}\}$

(j) Find $Z(n^2)$.

PART – B

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

UNIT - I

2 Reduce the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ into Echelon form and hence find its rank.

OR

3 Verify Cayley Hamilton theorem and hence find A^{-1}, where $A = \begin{bmatrix} 1 & -2 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$.

UNIT - II

4 (a) Using Newton's forward interpolation formula and the given table of values obtain the value of $f(x)$ when $x = 1.4$.

x	1.1	1.3	1.5	1.7	1.9
$f(x)$	0.21	0.69	1.25	1.89	2.61

(b) Using Lagrange's interpolation formula, find $y(10)$ from the following table.

x	5	6	9	11
y	12	13	14	16

OR

5 (a) Fit a straight line to the data given below:

x	1	3	5	7	9
y	1.5	2.8	4.0	4.7	6.0

(b) Evaluate $\int_0^6 \frac{1}{1+x}\,dx$ by using: (i) Simpson's ${}^1/_3$ rule. (ii) Simpson's ${}^3/_8$ rule.

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UNIT - III

6 Find $y(0.1)$ and $y(0.2)$ using Runge-Kutta 4th order formula given that $y' = x^2 - y$ and $y(0) = 1$.

OR

7 Find the Fourier series of the periodic function defined as $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$.

UNIT - IV

8 Find the Fourier transform of $f(x)$ defined by $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$ and hence evaluate:

(i) $\int_0^\infty \frac{\sin p}{p}\, dp$. (ii) $\int_{-\infty}^\infty \frac{\sin ap . \cos px}{p}\, dp$.

OR

9 (a) Find $Z\left(\cos\frac{n\pi}{2}\right)$ *and* $Z\left(\sin\frac{n\pi}{2}\right)$.

(b) Find $Z^{-1}\left[\frac{2z}{(z-1)\,(z^2+1)}\right]$.

UNIT - V

10 (a) Form a partial differential equation by eliminating the arbitrary function 'f' from $xyz = f(x^2 + y^2 + z^2)$.

(b) Solve by the method of separation of variables $\frac{du}{dx} = 2\frac{du}{dt} + u$ where $u(x, 0) = 6e^{-3x}$.

OR

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

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