**Code: 13A54102** **R13**

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 $E\nabla = \Delta = \nabla E$.

(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.

Contd. in page 2

**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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