

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)

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 $\nabla \cdot \nabla = \Delta = \nabla \cdot \nabla$.(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 - I2 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 $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.

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 $y(x, t)$.
