Course Code : MAT 202 **JSRK/MW – 17 / 2021**

Third Semester B. E. (Computer Science and Engineering/Information Technology) Examination

ENGINEERING MATHEMATICS - III

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry marks as indicated against them.
(2) Use of Non-programmable calculator is permitted.
(3) Use of Normal Distribution table is permitted.

1. Solve any **Two** :—

(a) Find values of 1, m, n and A^{-1} if $A = \begin{bmatrix} 0 & 2m & n \\ l & m & -n \\ l & -m & n \end{bmatrix}$ is orthogonal 5 (CO 1)

(b) If $A = \begin{bmatrix} 3 & 1 & -1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$, find eigen values and eigen vectors of the matrix A^T. 5 (CO 1)

(c) Using Sylvestor's theorem verify $\log_e e^A = A$ if matrix

$$A = \begin{bmatrix} 0 & 1 \\ -2 & 3 \end{bmatrix}$$ 5 (CO 1)

2. Solve any **Two** :—

(a) Find the root of the equation $x\log_{10}x - 1.2 = 0$ correct to four decimal places by method of False position. 5 (CO 1)

(b) Solve by Crout's method the following system of equations :

$x + y + z = 1,\ \ 4x + 3y - z = 6,\ \ 3x + 5y + 3z = 4.$ 5 (CO 1)

(c) Using Taylor's series method solve the differential equation $\frac{dy}{dx} = xy^{\frac{1}{3}}$, $y(1) = 1$ and find the value of $y(1.1)$, $y(1.2)$ correct to four decimal places by taking $h = 0.1$ 5 (CO 1)

3. Solve :-

(a) Find the Z transform and draw pole zero plot, region of convergence of the sequence $x[n] = \left(\frac{-1}{3}\right)^{n} u(n)$ 3 (CO 2)

(b) Using change of scale property find $Z\left\{\frac{a^{n}}{n!}\right\}$ 2 (CO 2)

(c) Solve the difference equation $y_{k+1} - y_{k} = k + 1$, $y_{0} = 1$ 5 (CO 2)

4. Solve :

(a) The distribution function for a random variable X is

$$F(x) = \begin{cases} 1 - e^{-2x} & x \geqslant 0 \\ 0 & x \leqslant 0 \end{cases}$$

Find :

(i) Density function,

(ii) Probability that $X > 2$,

(iii) Probability that $-3 < X \leqslant 4$. 5 (CO 3)

(b) The joint density function of the random variables X and Y is

$$f(x, y) = \begin{cases} 8xy, & 0 \leqslant x \leqslant 1,\ 0 \leqslant y \leqslant x \\ 0 & \text{otherwise} \end{cases}$$

Find :

(i) Marginal density function of x,

(ii) Marginal density function of y

(iii) Conditional density of x

(iv) Conditional density of y. 5 (CO 3)

5. Solve :

(a) Find the m. g. f. of the random variable x if

$$x = \begin{cases} \frac{1}{2} & \text{with prob. } \frac{1}{2} \\ \frac{-1}{2} & \text{with prob. } \frac{1}{2} \end{cases}$$

Also find first four moments about the origin. 5 (CO 3)

(b) Find the range, Semi-interquartile range and mean deviation for

$$f(x) = \begin{cases} 2(1-x), & 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

5 (CO 3)

6. Solve any **Two** :—

(a) Establish the validity of the Poisson approximation to the binomial distribution. 5 (CO 3)

(b) If a binomial distribution with n = 100 is symmetric, find its coefficient of kurtosis. 5 (CO 3)

(c) Find mean, variance and moment generating function of exponencial distribution. 5 (CO 3)