Reg No.:______________ Name:______________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree (S,FE) Examination August 2021 (2015 Scheme)

Course Code: MA202

Course Name: PROBABILITY DISTRIBUTIONS, TRANSFORMS AND NUMERICAL METHODS

Max. Marks: 100 Duration: 3 Hours

Normal distribution table is allowed in the examination hall.

PART A (MODULES I AND II)

Answer two full questions.

1 a) A discrete random variable has the following probability distribution 7

x	0	1	2	3
$P[X=x]$	$\frac{k}{2}$	$\frac{k}{3}$	$\frac{k+1}{3}$	$\frac{2k+1}{6}$

Find (i) value of k (ii) $P[X \le 2]$ (iii) Mean

b) A discrete random variable X has the mean 6 and variance 2. If it is assumed that the distribution is binomial find (i) $P[5 \le X \le 7]$ (ii) $P[X \le 2]$ (iii) $P[X > 7]$ 8

2 a) The time in hours required to repair a machine is exponentially distributed with mean 2. What is the probability that the repairing time is (i) at most 1 hour (ii) at least 30 min? 7

b) If X is normally distributed with mean 1 and variance 4, then 8

(i) find $P[-3 < X < 3]$ (ii) obtain k if $P[X \le k] = 0.6$

3 a) If X is a Poisson variate such that $P[X=1] = 0.3$ and $P[X=2] = 0.2$ then find $P[X=0]$ 7

b) Let X has the probability density function $f(x) = \begin{cases} \frac{x+1}{2} & if -1 < x < 1 \\ 0 & otherwise \end{cases}$ Find the mean and standard deviation of X. 8

PART B (MODULES III AND IV)

Answer two full questions.

4 a) Find the Fourier Integral representation of $f(x) = \begin{cases} 1 & if\ |x| < 1 \\ 0 & if\ |x| > 1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin\lambda}{\lambda} \cos\lambda x \, d\lambda$ 7

b) Find the Fourier Sine & Cosine Transform of $f(x) = \begin{cases} 2-x & if\ 0 \le x \le 2 \\ 0 & if\ x \ge 2 \end{cases}$ 8

5 a) Using Convolution theorem find $L^{-1}\left[\frac{s^2}{(s^2+1)(s^2+4)}\right]$ 7

b) Evaluate the Laplace Transform of (i) $\frac{1-cost}{t}$ (ii) $\frac{se^{-2s}+\pi e^{-s}}{s^2+\pi^2}$ 8

6 a) Find the Fourier Transform of $f(x) = \begin{cases} x^2 & if|\,x| \le 1 \\ 0 & otherwise \end{cases}$ 7

b) Solve: $y'' - 3y' + 2y = 4e^{2t}$ given $y(0) = -3, y'(0) = 5$ by using Laplace Transform. 8

PART C (MODULES V AND VI)

Answer two full questions.

7 a) Apply Lagrange's interpolation formula to find the value of $y$at $x = 3$for the following data. 6

x	1	2	7	8
$y = f(x)$	4	5	5	4

b) Find a real root of $x^3 + x - 1 = 0$ lying between 0 and 1 by Newton- Raphson Method (Correct to three decimal places) 7

c) Fit a polynomial to the data using Lagrange's formula. 7

x	0	1	3	4
y	-5	0	2	5

Find the value of y at $x = 2$.

8 a) Apply Euler's Method to determine the values of y at $x = 0.1, 0.2$ and 0.3 for $y' = 1 - y$ given $y(0) = 0$. (Take $h = 0.1$) 6

b) Apply Gauss- Seidel Method to solve : $8x - 3y + 2z = 20, 4x + 11y - z = 33,$ $6x + 3y + 12z = 35.$ (Correct to two decimal places) 7

c) Evaluate $I = \int_0^1 e^x dx$ by (i) Trapezoidal Rule (ii) Simpson's one-third rule (correct to three decimal places) by taking $h = 0.1$. Also check the result by actual integration. 7

9 a) The population of a town is given as follows. 10

Year	1931	1941	1951	1961
Population(in lakhs)	66	81	93	101

Estimate the population increase during the period 1935 to 1955 using Newton's interpolation formula

b) Compute $y(0.2)$ given $\frac{dy}{dx} + y + xy^2 = 0, y(0) = 1$ by taking $h = 0.1$ using Runge- Kutta method of fourth order (correct to 4 decmals). 10

*****