### 02000MA202062204

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Name:

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S2 (PT) (S, FE) Examination January 2024 (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) If the probability is 0.05 that a certain wide-flange column will fail under a given (7) axial load, what are the probabilities that among 16 such columns
  - (i) at most two will fail
  - (ii) at least four will fail

b) Derive mean and variance of Poisson distribution. (8)

- <sup>2</sup> a) A random variable X has the pdf  $f(x) = \frac{x^2}{9}$ ,  $0 \le x \le 3$ . Find the mean and variance (7) of X.
  - b) In a test on 2000 electric bulbs, it was found that the life of a particular make, was (8) normally distributed with an average life of 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for
    - (i) more than 2150 hours
    - (ii) less than 1950 hours
    - (iii) more than 1920 hours but less than 2160 hours

a) A discrete random variable X has the following probability distribution 3

(7)

(7)

Х	0	1	2	- 3	4	5	6 *
P(x)	k	3k	5k	7k	9k	11k	13k
	Find (i) the value of k		(ii) $P(X \le 4)$		(iii) $P(X > $	5)	

b) In a distribution exactly normal 7% of the items are under 35 and 89% are under 63. (8)
Find the mean and standard deviation of the distribution.

## PART B (MODULES III AND IV) Answer two full questions.

Find the Fourier integral representation of  $f(x) = \begin{cases} 0, x < 0\\ \frac{1}{2}, x = 0\\ e^{-x}, x > 0 \end{cases}$ 

4 a)

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b) Find the Fourier transform of  $f(x) = e^{-|x|}$ 

5 a) Evaluate

6 a)

- (i)  $L\{t^2 \sin 2t\}$
- (ii)  $L\{e^{2t} sinh t\}$

b) Using convolution theorem find 
$$L^{-1}\left(\frac{1}{(s-a)s}\right)$$
 (8)

(7)

Find the Fourier sine transform of  $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$ 

b) Using Laplace transform solve  $\frac{d^3y}{dt^3} + \frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0$ , given y(0) = 1, y|(0) = (8)y||(0) = 2

# PART C (MODULES V AND VI) Answer two full questions.

7 a) Using Newton-Raphson method find the root of the equation  $e^{-x} = \sin x$  correct to (6) 4 decimal places.

b) Using Lagrange's interpolation formula find f(4) from the following data

x1357f(x)24120336720

c) Use Newton's forward difference formula to find an interpolating polynomial for (7) the following data

X	0	1	2 .	3				
у	0	2	6	18				
Solve the differential equation $\frac{dy}{dx} = \frac{y-x}{y+x}$ , $y(0) = 1$ , for $x = 0.1$ in steps of 0.02								

8 a)

using Euler's method.

- b) Using Simpson's  $\frac{1}{3}^{rd}$  rule evaluate  $\int_0^{0.6} e^{-x^2} dx$ , by taking 7 ordinates.
- c) Solve by Gauss- Seidel method 8x 3y + 2z = 20, 6x + 3y + 12z = (7)35, 4x + 11y - z = 33
- 9 a) Find the iterative formula for finding  $\sqrt{N}$ , where N is a positive real number, using (10) Newton-Raphson method. Hence find  $\sqrt{12}$ .
  - b) Use Runge-Kutta method of 4<sup>th</sup> order to find y when x = 1.2 in steps of 0.1, given (10) that  $\frac{dy}{dx} = x^2 + y^2$ , y(1) = 1.5

(7)

(6)

(7)

(8)

(7)