

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY  
FOURTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019**

**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 random variable X takes the values -3,-2,-1,0,1,2,3 such that  $P(X=0)=P(X>0)$  (7)  
 $=P(X<0)$  and  $P(X=-3) = P(X=-2) = P(X=-1) = P(X=1) = P(X=2) = P(X=3)$ . Obtain the probability distribution and the distribution function of X
- b) If the sum of the mean and variance of a binomial distribution for 5 trials is 1.8 (8)  
 Find the probability distribution function.
- 2 a) It is known that 2% of the accounts in a company are delinquent. If 5 accounts are (7)  
 selected at random, compute the following probabilities (i) atmost 2 accounts will be delinquent (ii) atmost 4 accounts will be delinquent
- b) Find the value of k and hence find the mean and variance of the distribution (8)  
 $f(x) = kx^2e^{-x} \quad 0 < x < \infty$
- 3 a) If X is uniformly distributed over  $(-\alpha, \alpha)$ ,  $\alpha < 0$ . Find  $\alpha$  so that (i)  $P(x > 1) = 1/3$  (7)  
 (ii)  $P(|x| < 1) = P(|x| > 1)$
- b) 5% of the observation in a normal distribution are below 5 and 25% of the (8)  
 observations are between 5 and 25. Find mean and SD

**PART B (MODULES III AND IV)**

*Answer two full questions.*

- 4 a) Find the fourier transform of  $f(x) = \begin{cases} 1 - |x| & \text{if } |x| \leq 1 \\ 0 & \text{if } |x| > 1 \end{cases}$  and also find fourier (7)  
 inverse transform
- b) Using fourier sine integral for  $f(x) = e^{-ax}$  show that  $\int_0^{\infty} \frac{\lambda \sin \lambda x}{\lambda^2 + a^2} d\lambda = \pi e^{-ax}$  (8)
- 5 a) Find the fourier sine transform of  $e^{-x}$ ,  $x \geq 0$ . Hence evaluate  $\int_0^{\infty} \frac{x \sin x}{1+x^2} dx$  (7)

- b) Find the Laplace transform of (i)  $te^{-t}\sin t$  (ii)  $\frac{\sin^2 t}{t}$  (8)
- 6 a) Solve  $\frac{d^2y}{dt^2} - 4\frac{dy}{dt} + 5y = 4e^{3t}$  given that  $y = 2, \frac{dy}{dt} = 7$  when  $t = 0$  (7)
- b) Using convolution theorem find  $L^{-1} \frac{s}{(s^2+a^2)^2}$  (8)

**PART C (MODULES V AND VI)**

*Answer two full questions.*

- 7 a) Using Newton Raphson method find correct to four decimal places, the root (8)  
between 0 and 1 of the equation  $x^3 - 6x + 4 = 0$
- b) The population of a town is as follows (12)
- | Year                     | 1941 | 1951 | 1961 | 1971 | 1981 | 1991 |
|--------------------------|------|------|------|------|------|------|
| Population<br>(in lakhs) | 20   | 24   | 29   | 36   | 46   | 51   |
- Estimate the population increase during the period 1946 to 1976
- 8 a) Apply Lagrange's formula to obtain the value of y when  $x=35$  given that (6)
- |   |     |     |    |    |
|---|-----|-----|----|----|
| x | 30  | 34  | 38 | 42 |
| y | -30 | -13 | 3  | 18 |
- b) Solve the equation using Gauss elimination method (7)  
 $2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16$
- c) Solve the system of equations  $4x + 2y + z = 14, x + 5y - z = 10, x + y + 8z = 20$  (7)  
using Gauss-Seidal iteration method
- 9 a) A solid of revolution is formed by rotating about the x axis, the area between the x (7)  
axis, the line  $x=0$  and  $x=1$  and a curve through the points with the following  
coordinates
- |   |        |       |       |       |       |
|---|--------|-------|-------|-------|-------|
| X | 0.0    | 0.25  | 0.50  | 0.75  | 1.00  |
| Y | 1.0000 | .9896 | .9589 | .9089 | .8415 |
- Estimate the volume of the solid formed using Trapezoidal rule
- b) Using Euler's method find  $y(0.2)$  and  $y(0.4)$  given  $\frac{dy}{dx} = x + y, y(0) = 1$  and  $h = 0.2$  (6)
- c) Use the fourth order Runge-Kutta method to find  $y(0.2)$  from  $\frac{dy}{dx} = y - x, y(0) = 2$  (7)  
taking  $h=0.1$