

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Fourth semester B.Tech examinations (S), September 2020

**Course Code: MA206****Course Name: PROBABILITY & STATISTICS AND NUMERICAL METHODS  
(BT, FT, MT)**

Max. Marks: 100

Duration: 3 Hours

*Statistical tables are permitted in the examination hall***PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) The probability mass function of a random variable X is given below (8)

X	0	1	2	3
f(X)	C	2C <sup>2</sup>	C <sup>2</sup>	3C <sup>2</sup>

Find 1) C 2)  $P(X \geq 1)$  3)  $E(X)$ 

- b) A random variable X follows Poisson distribution such that (7)

$$P(X = 0) = \frac{2}{3} P(X = 1) \cdot \text{Find } 1) P(X = 3) \quad 2) P(X > 3)$$

- 2 a) An agricultural co-operative claims that 90% of the water melons shipped out are ripe and ready to eat. Find the probabilities, using Binomial Distribution, that among 18 watermelons shipped out (8)

- i) All 18 are ripe and ready to eat.
- ii) At least 16 are ripe and ready to eat.
- iii) At most 14 are ripe and ready to eat.

- b) In a Normal Distribution 31% of the item are under 45 and 8% are above 64. Find its mean and standard deviation. (7)

- 3 a) Find the value of K for the probability density function
- $f(x)$
- given below and (8)

$$\text{hence find its mean and variance where } f(x) = \begin{cases} K e^{-a^2 x}, & x \geq 0 \\ =0 & \text{otherwise} \end{cases}$$

- b) In certain experiments the error made in determining the solubility of a substance is a random variable having the Uniform Density with
- $\alpha = -0.025$
- and
- $\beta = 0.025$
- what are the probabilities that such an error will be (7)

- i) Between 0.010 and 0.015
- ii) Between -0.012 and 0.012

## PART B

*Answer any two full questions, each carries 15 marks.*

- 4 a) The population consisting of 5 members 2, 3, 6, 8, 11. Consider all possible distinct samples of size 2 with replacement. Find the population mean, mean of the sampling distribution of mean and the standard deviation of the sampling distribution of mean. (8)
- b) The time at the counter for a customer to be served at a post office can be modelled as a random variable having mean = 176 seconds and variance = 256 seconds. The sample mean  $\bar{X}$  will be obtained from the times for a random sample of 100 customers. What is the probability, using central limit theorem, that  $\bar{X}$  will be between 175 and 178 seconds? (7)
- 5 a) The specification for certain kind of ribbon call for a mean breaking strength of 180 Pounds. If five pieces of ribbon have a mean breaking strength of 169.5 pounds with a standard deviation of 5.7 pounds, test the null hypotheses  $\mu=180$  pounds against the alternative hypotheses  $\mu < 180$  pounds at 1% level of significance. Assume the population distribution is normal. (8)
- b) A stenographer claims that she can take dictation at the rate of 120 words per minute can we reject her claim on the basis of 100 trials in which she demonstrate a mean of 116 words with standard deviation of 15 words. (Use 5% level of significance) (7)
- 6 a) The mean operating life of a random samples of 15 bulbs taken from a population with standard deviation 500 hrs is 8900 hours Find, (8)
- i) 95% confidence level
- ii) 90% confidence level for the population mean
- b) To test the claim that the resistance of an electric wire can be reduced by more than 0.05 ohms by allowing 32 values obtained for a sample wire yielded  $\bar{x}_1=0.136$  ohms and  $S_1=0.004$  ohms and 32 values obtained for alloy wire yielded  $\bar{x}_2=0.083$  ohms and  $S_2=0.005$  ohms at 0.05 level of significance, Does this support the claim ? (7)

## PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Use Lagrange's formula to find the value of  $y$  at  $x = 6$  from the following data (6)

x	3	7	9	10
y	168	120	72	63

- b) Using Newton - Raphson Method compute the  $\sqrt{51}$  correct to 4 decimal places. (7)
- c) Using Newton's forward interpolation formula, find the value of  $\sin 52^\circ$ , given that (7)

Sin 45 <sup>0</sup>	Sin 50 <sup>0</sup>	Sin 55 <sup>0</sup>	Sin 60 <sup>0</sup>	Sin 65 <sup>0</sup>
0.7071	0.7660	0.8192	0.8660	0.9063

- 8 a) Solve the following system of equations using Gauss elimination method (6)

$$x + 2y + z = 3, \quad 2x + 3y + 3z = 10, \quad 3x - y + 2z = 13$$

- b) Solve  $\frac{dy}{dx} = \log_{10}(x + y)$ ,  $y(0) = 2$  by Euler's method by choosing  $h = 0.2$ . (7)

Find  $y(0.2)$  and  $y(0.4)$

- c) Estimate the value of  $f(30)$  from the following table using Newton's backward interpolation formula (7)

x	21	25	29	33
f(x)	14.27	15.81	17.72	19.96

- 9 a) Evaluate  $\int_0^6 \frac{1}{1+x} dx$  by Simpson's  $\frac{1}{3}$  rule by 6 equal subintervals. Also, check by (6)

direct integration.

- b) Solve the following system by Gauss - Seidel iteration method (7)

$$10x + y + z = 12, \quad 2x + 10y + z = 13, \quad 2x + 2y + 10z = 14$$

- c) Using Runge-kutta method of order 4, find  $y(0.2)$  for the equation (7)

$$\frac{dy}{dx} = 3x + (0.5)y, \quad y(0) = 1, \text{ taking } h = 0.2.$$

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