

Reg No.: _____

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

Course Code: MA206

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

Max. Marks: 100

Duration: 3 Hours

Statistical Table is permitted inside the examination hall

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) The PMF of a random variable X is (7)
- | | | | | | | | |
|-------|---|----|----|----|----|-----|-----|
| X: | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| f(x): | k | 3k | 5k | 7k | 9k | 11k | 13k |
- (i) Find k (ii) Evaluate $P(X < 4)$ (iii) $P(3 \leq X \leq 6)$
- b) If x is a continuous random variable with pdf given by (8)

$$f(x) = \begin{cases} \frac{x}{8}, & 0 < x < 2 \\ \frac{1}{4}, & 2 < x < 4 \\ \frac{6-x}{4}, & 4 < x < 6 \\ 0, & \text{otherwise} \end{cases}$$

Obtain the distribution function

- 2 a) Consider a lot of 10 items containing 3 defectives from which a sample of 4 items (8)
 is drawn from at random. Let the random variable X denote the number of
 defective items in the sample.
 Evaluate,
 (i) PMF of X
 (ii) $P(X < 1)$
 (iii) Distribution function
- b) The mileage which a car owners get with a certain kind of radial tyre is a random (7)
 variable having an exponential distribution with mean 20,000 km . Find the
 probability that one of these tyres will last (i) atleast 10,000 km (ii) atmost 10,000
 km

- 3 a) Prove that Poisson distribution is the limiting form of Binomial Distribution. (7)
- b) The weekly wages of 1000 workmen are normally distributed around a mean of Rs 70 and with a standard deviation of Rs 5. Estimate the number of workers whose weekly wages will be (8)
- (i) between Rs 70 and Rs 72
 - (ii) more than 75
 - (iii) less than 63

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) (i) Explain the difference between statistics and parameter (7)
- (ii) Prove that the sampling distribution of the mean $\mu(\bar{x}) = \mu$ when σ is known and samples are taken from the normal population
- b) In 64 randomly selected hours of production, the mean and standard deviation of the number of acceptable pieces produced by an automatic stamping machine are 1038 and 146 respectively. At the 0.05 level of significance, does this enable us to reject the null hypothesis $\mu > 1000$? (8)
- 5 a) A random sample is taken from a normal population with mean 30 and S.D. 4. How large the sample should be taken if the sample mean is to lie between 25 and 35 with probability 0.98 (8)
- b) (i) Explain two kinds of errors in testing a statistical hypothesis. (7)
- (ii) A trucking firm is suspicious of the claim that the average life time of certain tyre is at least 28,000 miles. To check the claim the firm puts out 40 of these tires on its trucks and gets a mean lifetime of 27,463 miles with standard deviation of 1,348 miles. What can it conclude if the probability of type 1 error is to be at most 0.01
- 6 a) The mean of the sample of the size 20 from a normal population $N(\mu, 8)$ was found to be 81.2. Find a 90% confidence interval for μ (7)
- b) Random samples of size 500 and 400 are found to have mean 11.5 and 10.9 respectively. Can the samples be regarded as random samples drawn from the same population, whose SD is 5? Find the p-value (8)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Find a positive solution of $2\sin x = x$ using Newton's method. (6)

- b) Find the values of y at $x = 21$ from the following table using Newton's interpolation formula (7)

| | | | | |
|---|-------|--------|--------|--------|
| x | 20 | 23 | 26 | 29 |
| y | 0.342 | 0.3907 | 0.4384 | 0.4848 |

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

$$23x + 13y + 3z = 29, \quad 5x + 23y + 7z = 37, \quad 11x + y + 23z = 43$$

- 8 a) Using Lagrange's formula find the polynomial passing through (0,0), (1,1), (2,2) (6)

- b) Evaluate $\int_0^4 e^x dx$ by Simpson's Rule and compare it with actual value (7)

- c) Using Euler's method, solve for y at $x = 0.1$ from $\frac{dy}{dx} = x + y + xy$ $y(0) = 1$ taking step size 0.025 (7)

- 9 a) Find a solution of $f(x) = x^3 + x^2 - 1 = 0$ by iteration correct to 4 decimal places (7)

- b) Using Newton-Raphson method evaluate $\sqrt[3]{41}$ (cube root of 41) correct to 4 decimal places (6)

- c) Apply Runge-Kutta method of fourth order find $y(0.1)$ given (7)

$$\frac{dy}{dx} = x^2 - y, y(0) = 1 \text{ (take } h = 0.1)$$