Code No: 132AC **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year II Semester Examinations, August - 2018
MATHEMATICS - III
((Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, MIE, PTM, CEE, MSNT)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Find the mean and variance of the probability distribution having pdf, $f(x) = e^{-x}, x > 0$. [2]

b) A fair coin is tossed until a head or consecutive five tails occurs. Find the discrete probability distribution. [3]

c) Write the conditions of validity of χ^2-test. [2]

d) Construct sampling distribution of means for the population 3, 7, 11, 15 by drawing samples of size two without replacement. Determine i) μ ii) σ iii) Sampling distribution of means. [3]

e) Discuss types of errors of the test of hypothesis. [2]

f) Give the graphical interpretation of the bisection method. [3]

g) Write the iterative formula for finding $\sqrt[3]{N}$ using method of false position. [2]

h) Explain briefly about method of least square. [3]

i) Derive Trapezoidal rule for computing integral $\int_a^b f(x)dx$. [2]

j) What are the limitations of Taylor's series method? [3]

PART-B

(50 Marks)

2.a) Let $f(x) = 3x^2$, when $0 \le x \le 1$ be the probability density function of a continuous random variable X. Determine a and b such that

i) $P(X \le a) = P(X > a)$ ii) $P(X > b) = 0.05$.

b) Probability density function of a random variable X is

$$f(x) = \begin{cases} \frac{1}{2} sinx, 0 \le x \le \pi \\ 0, \quad elsewhere \end{cases}.$$

Find the mean, mode and median of the distribution. [5+5]

OR

3.a) A die is cast until 6 appears. What is the probability that it must be cast more than 5 times?

b) The marks obtained in mathematics by 1000 students is normally distributed with mean 78% and standard deviation 11%. Determine:

i) What was the highest mark obtained by the lowest 25% students?

ii) Within what limit did the middle 90% of the student lie? [5+5]

4.a) Explain why the larger variance is placed in the numerator of the statistic F. Discuss the application of F-test in testing if two variances are homogenous.

b) A sample of 11 rats from a central population had an average blood viscosity of 3.92 with a standard deviation of 0.61. Estimate the 95% confidence limits for the mean blood viscosity of the population. [5+5]

OR

5.a) The mean voltage of a battery is 15 and standard deviation 0.2. Find the probability that four such batteries connected in series will have a combined voltage of 60.8 or more volts.

b) Discuss critical region and level of significance with example. [5+5]

6.a) Suppose the diameter of motor shafts in a lot have a mean of 0.249 inches and standard deviation if 0.003 inches. The inner diameter of bearings in another lot have a mean of 0.255 inches and standard deviation of 0.002 inches. If a shaft and bearing are selected at random, find the probability that the shaft will not fit inside the bearing. Assume that both dimensions are normally distributed.

b) A sample of 400 items is taken from a normal population whose mean is 4 and variance 4. If the sample mean is 4.45, can the samples be regarded as a simple sample? [5+5]

OR

7. In a sample of 600 students of a certain college 400 are found to use ball pens. In another college from a sample of 900 students 450 were found to use ball pens. Test whether two colleges are significantly different with respect to the habit of using ball pens? [10]

8. Estimate y at $x = 5$ by fitting a least squares curve of the form $y = \frac{b}{x(x-a)}$ to the following data [10]

x	3.6	4.8	6.0	7.2	8.4	9.6	10.8
y	0.83	0.31	0.17	0.10	0.07	0.05	0.04

OR

9. Show that the Gauss-Seidel methods diverge for solving the system of equations
2x + 3y + z = -1; 3x + 2y + 2z = 1; x + 2y + 2z = 6. [10]

10. Find the successive approximate solution of the differential equation $y' = y$, $y(0) = 1$ by Picard's method and compare it with exact solution. [10]

OR

11. Use Runge-Kutta method of order four to find y when $x = 0.6$ in steps of 0.2 given that $\frac{dy}{dx} = 1 + y^2, y(0) = 0$. [10]

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