

Code No: 132AC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, May - 2019

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) Let X denotes the number of heads in a single toss of 4 fair coins. Determine  $P(1 < X \leq 3)$  [2]
- b) Define moment generating function of a random variable. [3]
- c) Define central limit theorem. [2]
- d) A random sample of size 100 has a standard deviation of 5. What can you say about maximum error with 95% confidence? [3]
- e) Define Type I and Type II errors. [2]
- f) Explain one way classification of ANOVA. [3]
- g) Establish an iterative formula for computing  $\sqrt{N}$  by Newton Raphson method. [2]
- h) Construct normal equations for fit a straight line by method of least squares. [3]
- i) Write Simpsons  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule formulas. [2]
- j) Given  $y' = xy$  with  $y(0) = 1$ . Find  $y(0.2)$  with  $h = 0.1$  by Euler's method. [3]

**PART-B****(50 Marks)**

- 2.a) A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number of defective items.
- b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution. [5+5]

**OR**

- 3.a) Let the continuous random variable X have the probability density function,
 
$$f(x) = \begin{cases} 2/x^3, & \text{if } 1 < x < \infty \\ 0, & \text{other wise} \end{cases}$$
 Find F(x).
- b) A discrete random variable X has the mean 6 and variance 2. If it is assumed that the distribution is Binomial find the probability that  $5 \leq x \leq 7$ . [5+5]
- 4.a) A random sample of size 100 is taken from an infinite population having mean  $\mu=76$  and the variance  $\sigma^2=256$ . What is the probability that mean of the sample will be between 75 and 78?
- b) Assuming that  $\sigma = 20.0$ , how large a random sample be taken to assert with probability 0.95 that the sample mean will not differ from the true mean by more than 3.0 points? [5+5]

**OR**

- 5.a) A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative.
- b) Find 95% confidence limits for the mean of a normality distributed population from which the following sample was taken 15, 17, 10, 18, 16, 9, 7, 11, 13, 14. [5+5]
- 6.a) In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes. Can we reject the null hypothesis  $\mu = 32.6$  minutes in favour of alternative null hypothesis  $\mu > 32.6$  at  $\alpha = 0.025$  level of significance.
- b) The mean life of a sample of 10 electric bulbs was found to be 1456 hours with S.D. of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with S.D. of 398 hours. Is there a significant difference between the means of two batches? [5+5]

**OR**

7. The following are the number of typing mistakes made in four successive weeks by four typists working for a publishing company.

Typist I	13	16	12	14
Typist II	14	16	11	19
Typist III	13	18	16	14
Typist IV	18	10	14	15

- Using ANOVA, test at 0.05 level of significance whether the difference among the four sample means can be attributed to chance. [10]
- 8.a) Find a real root of  $xe^x - \cos x = 0$  using Newton-Raphson method.
- b) Fit a least square parabola curve to the following data: [5+5]
- |   |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|
| x | 0   | 1   | 2   | 3   | 4   | 5   | 6   |
| y | 1.4 | 2.8 | 2.4 | 2.9 | 3.6 | 4.0 | 4.1 |
- 9.a) Find the root of the equation  $2x - \log x = 7$  which lies between 3.5 and 4 by regula-falsi method.
- b) Solve the following system of equations by Gauss-Seidel method [5+5]  
 $8x_1 + x_2 - x_3 = 8$ ,  $2x_1 + x_2 + 9x_3 = 12$ ,  $x_1 - 7x_2 + 2x_3 = -4$
10. Find  $y(0.1)$  and  $y(0.2)$  using 4<sup>th</sup> order Runge - Kutta method given that  $y' = xy + y^2$ ,  $y(0) = 1$ . [10]

**OR**

11. Solve the equation  $y' = x + y^2$  subject to the condition  $y(0) = 1$  by Picard's method. [10]

---ooOoo---