Code No: 132AC **R16**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech I Year II Semester Examinations, August/September - 2017**
**MATHEMATICS-III**
**(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, MIE, 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) Determine the Binomial distribution for which the mean is 4 and variance 3. [2]

b) Suppose a continuous random variable X has the probability density $f(x) = K(1-x^2)$ for $0 < x < 1$ and $f(x) = 0$ otherwise. Find $K$ and mean. [3]

c) Find the value of finite population correction factor for n=10 and N=1000. [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) Explain One-tailed and Two-tailed tests. [2]

f) Explain F-distribution and its uses in ANOVA. [3]

g) Write normal equations for fit a second degree polynomial. [2]

h) Establish an iterative formula for computing the value $1/N$, hence find for $N=17$. [3]

i) Write any two formulae for evaluating of numerical integration. [2]

j) Apply 2nd order Runge-Kutta method to find $y(0.2)$, where $y' = x + \sqrt{y}$ & $y(0) = 1$? [3]

**PART-B**

**(50 Marks)**

2.a) If X is a continuous random variable and $Y = aX + b$, prove that $E(Y) = aE(X) + b$ and $V(Y) = a^2V(X)$ , where $V$ stands for variance and $a$, $b$ are constants.

b) If a Poisson distribution is such that $P(X=1).\frac{3}{2} = P(X=3)$, find:

i) $P(X \le 3)$ ii) $P(2 \le X \le 5)$. [5+5]

**OR**

3.a) If probability density function $f(x) = \begin{cases} Kx^3, & \text{in } 0 \le x \le 3 \\ 0, & \text{elsewhere} \end{cases}$. Find the value of $K$ and find the probability between $x = 1/2$ and $x = 3/2$.

b) The mean and standard deviation of the marks obtained by 1000 students in an examination are respectively 34.5 and 16.5. Assuming the normality of the distribution, find the approximate number of students expected to obtain marks between 30 and 60. [5+5]

4.a) The mean height of students in a college is *155 cms* and standard deviation is *15*. What is the probability that the mean height of *36* students is less than *157 cms*.

b) What is the maximum error one can expect to make with probability *0.90* when using the mean of a random sample of size *n= 64* to estimate the mean of population with $\sigma^2 = 2.56$. [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) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of *0.06* with atleast *95%* confidence. [5+5]

6.a) According to the norms established for an electrical aptitude test, persons who are *18* years old have an average height of *73.2* with a standard deviation of *8.6*. If *4* randomly selected persons of that age averaged *76.7*, test the hypothesis $\mu = 73.2$ against the alternative hypothesis $\mu > 73.2$ at the level of significance.

b) In sample of *1000* people in Karnataka *540* are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at *1%* level of significance? [5+5]

**OR**

7.a) An oceanographer wants to check whether the depth of the ocean in a certain region is *57.4* fathoms, as had previously been recorded. What can he concluded at the level of significance $\alpha = 0.05$, if readings taken at *40* random locations in the given region yielded a mean of *59.1* fathoms with a standard deviation of *5.2* fathoms.

b) 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 | 14 | 15 |
| Typist II | 14 | 16 | 19 | 15 |
| Typist III | 13 | 18 | 14 | 18 |
| Typist IV | 18 | 10 | 15 | 12 |

Using ANOVA, test at 0.05 level of significance whether the difference among the four sample means can be attributed to chance. [5+5]

8.a) Show that the iteration scheme $f(x) = \frac{-1}{x^2-3}$ converges and hence find a real root of $f(x) = x^3 - 3x + 1$ near $x = 3$.

b) Solve the following system of equations by Gauss-Seidel method $4x_1 + 2x_2 + x_3 = 11,\ -x_1 + 2x_2 = 3,\ 2x_1 + x_2 + 4x_3 = 16$. [5+5]

**OR**

9.a) Find a root of $f(x) = x^3 - x - 2$ correct up to three decimal places by bisection method.

b) Fit the curve of best fit of the type $y = ae^{bx}$ to the following data: [5+5]

| x | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 |
|---|---|---|---|---|---|---|
| y | 0.10 | 0.45 | 2.15 | 9.15 | 40.35 | 180.75 |

10.a) Evaluate $\int_0^1 e^{-x^2}\,dx$ using Simpson's *1/3*$^{rd}$ rule taking $h = 0.1$.

b) Using Runge – Kutta Second order formula, solve the equation $y' = 2 + \sqrt{xy}$ with $y(1) = 1$ for $x = 1(0.2)1.4$. [5+5]

**OR**

11.a) Using Euler's method solve for $y(2)$ from $y' = 3x^2 + 1,\ y(1) = 2$ taking step size $h = 0.25$.

b) Solve $y' = 2y + 3e^x$ with $y(0) = 0$ using Taylor's series method to find the values of $y$ for $x = 0.1$ and $0.2$. [5+5]

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