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B.Tech. Degree V Semester Regular Examination November 2021

CS/CE/ EC/EE/IT/ME/SE 19-200-0501 NUMERICAL AND STATISTICAL METHODS
(2019 Scheme)

Time: 3 Hours

Maximum Marks: 60

PART A
(Answer *ALL* questions)

(8 × 3 = 24)

- I. (a) Find a positive value of $(17)^{1/3}$ correct to three places of decimal using Newton-Raphson method.
(b) Prove that,

$$(i) \quad \mu^2 = 1 + \frac{\delta^2}{4}$$

$$(ii) \quad 1 + \mu^2 \delta^2 = \left(1 + \frac{\delta^2}{2}\right)^2$$

- (c) Prove that,

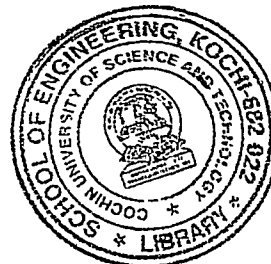
$$h f'(a) = \Delta f(a) - \frac{1}{2} \Delta^2 f(a) + \frac{1}{3} \Delta^3 f(a) \dots\dots\dots$$

- (d) $\frac{dy}{dx} = 1 + xy, y(0) = 1$ using Taylor series method. Compute $y(0.1)$ correct to 4 decimal places.
(e) An urn contains four white and three red balls. Three balls are drawn with replacement. Find the mean and variance of number of red balls drawn.
(f) By method of least squares find the best fitting straight line to the following data.

x:	0	1	2	3	4
y:	1	3	6	10	15

- (g) Define the following terms.
(i) Parameter and statistic
(ii) Type I and Type II errors
(iii) Standard error.
(h) Assuming the mean height of soldiers to be 68.22 inches with a variance of 10.8 inches, find how many soldiers in a regiment of 1000 would you expect to be over 6 feet tall

(P.T.O)



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PART B

(4 × 12 = 48)

- II. (a) Find the solution of the following system of equations using Gauss-Seidal method.

$$83x + 11y - 4z = 95$$

$$7x + 52y + 13z = 104$$

$$3x + 8y + 29z = 71$$

- (b) The population of a town is as follows:

Year	1961	1971	1981	1991	2001
Population (in thousands):	24	29	36	46	51

Estimate the increase in population during the period 1966 to 1996.

OR

- III. (a) Use Newton's dividend difference to find $f(7)$ and $f(10)$ if
 $f(3) = 24$, $f(5) = 120$, $f(8) = 504$, $f(9) = 720$, $f(12) = 1716$

- (b) Find a real root of $x^3 - 9x + 1 = 0$ by Regula-Falsi method.

- IV. (a) A slider machine moves along a fixed straight rod. It's distance x cm along the rod is given below for various values of time t sec. Find the velocity and acceleration when $t = 0.3$ sec.

t:	0.2	0.3	0.4	0.5	0.6
x:	32.87	33.64	33.95	33.81	33.24

- (b) Compute $\int_0^6 \frac{dx}{1+x^2}$ using

(i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rule

OR

- V. (a) Use modified Euler's method to approximate y when $x = 0.1$ given

$$\frac{dy}{dx} = \frac{y-x}{y+x}, \quad y(0) = 1 \text{ by taking } h = 0.1$$

- (b) By Runge-Kutta method of fourth order calculate the value of y for

$$x = 0.2 \text{ correct to 3 decimal places when } \frac{dy}{dx} = x - 2y, \quad y(0) = 0$$

taking $h = 0.1$

(Continued to 3)

BTS-V(R)-11-21-0937

- VI. (a) A Screw manufacturing company is known to produce 5% defectives in a random sample of 15 screws. What is the probability that there are
- Exactly 3 defectives
 - Not more than three defectives
- (b) Find mean and variance of Poission distribution.

OR

- VII. (a) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution.
- (b) Fit an equation of the form $y = ab^x$ to the following data:

x:	2	3	4	5	6
y:	144	173	207	249	299

- VIII. (a) The mean height of college students in a city are normally distributed with SD 6 cm. A sample of 100 students has mean height 158 cm. Test the hypothesis that mean height of students in the city is 160 cm.
- (b) Given the following data of two distributions

	Size of sample	Mean	SD
A	80	100	12
B	70	95	10

Test whether difference between the sample means is significant.

OR

- IX. (a) The SD of a sample of 20 observations from a normal population was found to be 5. Examine whether the sample was taken from a population with SD 5.3.
- (b) Two independent of size $n_1 = 10, n_2 = 7$ when observed have sample variance $s_1^2 = 16, s_2^2 = 3$ using $\alpha = 0.01$ Test $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_1 : \sigma_1^2 \neq \sigma_2^2$

