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B.Tech. Degree V Semester Supplementary Examination
November 2020 / April 2021

CE/CS/EC/EE/IT/ME/SE-AS 15-1501 NUMERICAL AND STATISTICAL METHODS
(2015 Scheme)

Time: 3 Hours

Maximum Marks: 60

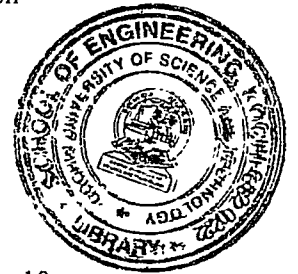
PART A
(Answer ALL questions)

(10 × 2 = 20)

- I. (a) Develop an iteration formula to find p^{th} root of 'a' using Newton – Raphson method.
- (b) Prove that $\left(\frac{\Delta^2}{E}\right)x^3 = 6x$, interval of differencing being unity.
- (c) Prove that $h f'(a) = \Delta f(a) - \frac{1}{2} \Delta^2 f(a) + \frac{1}{3} \Delta^3 f(a) - \dots$
- (d) Using Lagrange's interpolation formula, find the value of y when $x = 10$ using the following table:

x :	5	6	9	11
y :	12	13	14	16

- (e) Develop a general polynomial for numerical integration.
- (f) Find the mean and variance of the random variable with pdf $f(x) = k(1-x^2)$, $0 < x < 1$.
- (g) The probabilities of a Poisson variate taking the values 3 and 4 are equal. Calculate the probabilities of the variate taking the values 0 and 1.
- (h) The standard deviation of a sample of size 50 is 3.6. Examine whether the sample was taken from a population with S.D. 3.3. ($\alpha = 5\%$)
- (i) Define the following:
- Standard error
 - Critical region
 - Type I error
 - Null hypothesis
- (j) Using Taylor series method compute the solution of $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ at $x = 0.1$



(P.T.O.)

PART B

(4 × 10 = 40)

- II. (a) Find a real root of $x^3 - x^2 - 2 = 0$ by Regula - falsi method.
 (b) The following table gives corresponding values of x and y . Prepare the forward difference table and express y as a function of x . Also obtain y when $x = 2.5$.

x :	0	1	2	3	4
y :	7	10	13	22	43

OR

- III. (a) Solve the following system of equations by Gauss-Seidel method
 $27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$
 (b) Apply Stirling's formula to find $y(28)$ for the following data:

x :	20	25	30	35	40
y :	49225	48316	47236	45926	44306

- IV. (a) Find $f'(1.1)$ and $f''(1.1)$ from the following table

x :	1.0	1.2	1.4	1.6	1.8	2.0
$f(x)$:	0	0.1280	0.5440	1.2960	2.4320	4.0000

- (b) When a train is moving at 30 m/sec. steam is shut off and breaks are applied. The speed of the train U in m/sec after t sec. is given by

T	0	5	10	15	20	25	30	35	40
V	30	24	19.5	16	13.6	11.7	10.0	8.5	7.0

Using Simpson's rule, determine the distance moved in 40 secs.

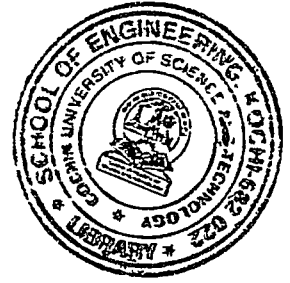
OR

- V. (a) Explain Euler's method for solving a first order ordinary differential equation and use it to compute
 $y(0.2)$ where $\frac{dy}{dx} = y - x^2 + 1$, $y(0) = 0.5$
 (b) Use Runge-Kutta method to find y when $x = 1.1$, given that
 $\frac{dy}{dx} = x^2 + y^2$ and $y(1) = 1.5$.
- VI. (a) The probability that a pen manufactured by a company will be defective is $\frac{1}{10}$. If 12 such pens are manufactured, find the probability that
 (i) exactly two will be defective
 (ii) at least two will be defective
 (iii) none will be defective
 (b) If X is a normal variate with mean 30 and s.d. 5
 find (i) $p(26 \leq x \leq 40)$ (ii) $p(X > 45)$

OR

(Continued to 3)

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- VII. (a) Fit a second degree curve of the form
 $y = ax^2 + bx + c$ to the following data:

x :	1	2	3	4	5
y :	3	9	13	21	31

- (b) Obtain mean and variance of Poisson distribution.
- VIII. (a) The average marks in Mathematics for a sample of 100 students was 51 with a S.D. of 6 marks. Could this have been a random sample from a population with average marks 50 if $\alpha = 5\%$.
- (b) The intelligence test of 2 groups of boys and girls gives the following results

Girls	S.D. = 10	n = 121
Boys	S.D. = 12	n = 81

Is difference in S.D.s significant?

OR

- IX. Two random samples reveal the following data:

sample	size	mean	variance
I	16	440	40
II	25	460	42

Test whether the samples came from the same normal population.
