BTS-V-11.19-1360 Reg. No. 12180063

C

B.Tech. Degree V Semester Examination November 2019

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 the cube root of N using Newton-Raphson method.

(b) Prove that $\mu^2 = 1 + \frac{\delta^2}{4}$.

(c) From the following table, express y as a function of x.

x:	1	2	3	4
y:	3	6	11	18

(d) Prove that $hf'(a) = \Delta f(a) - \frac{1}{2}\Delta^2 f(a) + \frac{1}{3}\Delta^3 f(a) - \frac{1}{4}\Delta^4 f(a) + \ldots$

(e) Using Taylor series method compute the solution of $\frac{dy}{dx} = x + y$, $y(0) = 1$ at the point $x = 0.2$ correct to 3 decimal places.

(f) Find the mean and variance of the total number of heads obtained when an unbiased coin is tossed 3 times.

(g) If x follows Poisson distribution such that $p(x=1) = p(x=2)$ find $p(x=3)$.

(h) Write the normal equations to fit a power curve of the form $y = ax^b$.

(i) Explain the two types of errors that may be committed in sampling.

(j) Define (i) critical region (ii) level of significance (iii) test statistic.

PART B

(4 × 10 = 40)

II. (a) Find a real root of $x^3 + x - 1 = 0$, near $x = 1$ correct to three decimal places by the method of false position.

(b) Solve the following system of equations by Gauss-Seidel method.

$10x + 2y + z = 9, \quad x + 10y - z + 22 = 0, \quad -2x + 3y + 10z = 22.$

OR

III. (a) From the following table of half yearly premium for policies maturing at different ages, estimate the premium for policies maturing at ages 46 and 53.

Age (x):	45	50	55	60	65
Premium (y):	1150	960	830	740	680

(b) Use Newton's divided formula to evaluate $f(7)$ if $f(3) = 24$, $f(5) = 120$, $f(8) = 504$, $f(9) = 720$ and $f(12) = 1716$.

(P.T.O.)

IV. (a) Find the derivative at the middle point for the given data:

x:	0	3	6	9	12	15	18
y:	135	149	157	183	201	205	193

(b) The speed, v meters per second, of a car after it starts, is shown in the following table:

t:	0	12	24	36	48	60	72	84	96	108	120
v:	0	3.6	10.08	18.9	21.6	18.54	10.26	5.4	4.5	5.4	9.0

Find the distance travelled by the car in 2 minutes.

OR

V. (a) Use improved Euler's method to approximate y when $x = 0.1$ given $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ by taking $h = 0.1$.

(b) By Runge-Kutta method of order 4, calculate the value of y for $x = 0.2$ correct to 3 decimal places when $\frac{dy}{dx} = x - 2y$, $y(0) = 0$ taking $h = 0.1$.

VI. (a) Six dice are thrown 720 times. How many times do you expect at least 3 dice show a five or six.

(b) Find the mean and variance of the Poisson distribution.

OR

VII. (a) In a competitive examination, 5000 students have appeared for a paper in mathematics. Their average marks was 62 and standard deviation 12. If there are only 100 vacancies, find the minimum marks that one should score in order to get selected.

(b) Fit a parabolic curve to the following data.

x:	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y:	1.1	1.3	1.6	2.0	2.7	3.4	4.1

VIII. (a) An engineer making engine parts with axle diameter 0.7 inches and s.d. of 0.04 inches. A random sample of 10 parts shown a mean of 0.742 inches. Test the hypothesis $H_0 = \mu = 0.7$ against $H_1 : \mu \neq 0.7$ at 5% level of significance.

(b) The means of two random samples of size 1000 and 2000 are 67.5 and 68 inches respectively. Can the samples be regarded to have been drawn from the same population with S.D 9.5 inches? Test at 5% level of significance.

OR

IX. (a) A sample of 200 students has S.D. 5.5. Test whether the sample was taken from the above population with S.D. 5.

(b) Two independent random sample of size $n_1 = 10$, $n_2 = 7$ when observed to have sample variances $s_1^2 = 16$, $s_2^2 = 3$ using $\alpha = 0.01$. Test $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_1 : \sigma_1^2 \neq \sigma_2^2$.

***