Course Code: 23BS3T01

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II - B. Tech I-Semester Supplementary Examinations (BR23), Mar - 2026

NUMERICAL TECHNIQUES AND STATISTICAL METHODS

(Civil Engineering)

Time: 3 hours　　　　　　　　　　　　　　　　　　　　Max. Marks: 70

Question Paper consists of Part-A and Part-B

*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Define the PROCEDURE OF Regula – Falsi Method to find the root of an equation.	(2M)	CO1	L3
b)	Evaluate $\Delta \sin(px+q)$	(2M)	CO1	L4
c)	Using Trapezoidal rule, find $\int_0^6 f(x)\,dx$ from the following set of values of x and f(x).	(2M)	CO2	L3

x:	0	1	2	3	4	5	6
f(x):	1.56	3.64	4.62	5.12	7.08	9.22	10.44

d)	Solve $\frac{dy}{dx} = xy+1$ and y(0)=1 using Taylor's series method.	(2M)	CO2	L3
e)	If X is a discrete random variable with the following probability function	(2M)	CO3	L3

x:	0	1	2
p(x):	1/4	1/2	1/4

Find the mean of the distribution

f)	If X follows uniform distribution on [1, 5], find the mean and variance of the distribution.	(2M)	CO3	L3
g)	Define a sample and statistic.	(2M)	CO4	L1
h)	A researcher wants to estimate the average weight of a certain type of apple. A random sample of n = 100 apples shows a mean weight of 200 grams with a sample standard deviation of 20 grams. Find the Maximum Error of Estimate (Margin of Error) at a 95% confidence level.	(2M)	CO4	L3
i)	Define null and alternative hypotheses.	(2M)	CO5	L1
j)	Write the applications of chi-square distribution.	(2M)	CO5	L2

PART–B (5X10 = 50M)

2a.	Apply bisection method to find a root of the equation $xe^x = 1$ correct to three decimal places.	5(M)	CO1	L3
b.	Estimate y(10) from the following data, using Lagrange's interpolation formula.	5(M)	CO1	L3

x	5	6	9	11
y	12	13	14	16

(OR)

3a. Find a real root of $3x - \cos(x) - 1 = 0$ by using Newton-Raphson method correct to four decimal places. 5(M) CO1 L3

b. The population of a town in the decimal census was given below. Estimate the population for the 1925 5(M) CO1 L3

Year (x)	1891	1901	1911	1921	1931
Population in thousands	46	66	81	93	101

4a. Use Simpson's 1/3rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates. 5(M) CO2 L3

b. Using Euler's method, solve for y at x = 2 from $\frac{dy}{dx} = 3x^2 + 1$, y (1) = 2, taking step size h = 0.5. 5(M) CO2 L3

(OR)

5 Find y(0.1) and y(0.2) by R-K method of 4th order for the D.E. $y' = x^2 - y$ and y(0) = 1. 10(M) CO2 L4

6a. It is observed that 50% of mails are spam. There is a software that filters spam mail before reaching the inbox. Its accuracy for detecting a spam mail is 99% and chances of tagging a non-spam mail as spam mail is 5%. If a certain mail is tagged as spam find the probability that it is not a spam mail. 5(M) CO3 L3

b. A car hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days on which (i) neither car is used and (ii) the proportion of days on which some demand is refused? 5(M) CO3 L3

(OR)

7 Fit a binomial distribution to the following data: 10(M) CO3 L4

x	0	1	2	3	4	5
f	2	14	20	34	22	8

8a. A random sample of size 64 is taken from an infinite population having the mean 45 and standard deviation 8. What is the probability that sample mean will be between 46 and 47.5. 5(M) CO4 L3

b. Explain about point estimation. 5(M) CO4 L2

(OR)

9. A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size 2 which can be drawn without replacement from this population. Find (i) mean of the population (ii) standard deviation of the population (iii) mean of the sampling distribution of means (iv) standard deviation of the sampling distribution of means. 10(M) CO4 L3

10 a.	A random sample of 1000 men from North India gives their mean wage to be Rs. 30 per day with a S. D. Rs 1.50. A sample of 1500 men from southern India gives a mean of Rs. 32 per day with S.D. of Rs 2. Does the mean rate of wages vary between the two companies?	5(M)	CO5	L3
b.	In a sample of 400 parts manufactured by a factory, the number of defective parts was found to be 30. The company, however, claimed that only 5% of their product is defective. Is the claim tenable?	5(M)	CO5	L3
	(OR)			
11.	The time taken by workers in performing a job by method I and method II is given below:	10(M)	CO5	L5

Method I	20	16	26	27	23	22	--
Method II	27	33	42	35	32	34	38

Do the data show that the variances of time distributions of populations from which these samples are drawn do not differ significantly?

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