Course Code: 23HS0832 **R23**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR
(AUTONOMOUS)

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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Numerical & Statistical Methods (23HS0832) **Course & Branch**: B.Tech -CE

Year &Sem: II-B.Tech& I-Sem **Regulation:** R23

UNIT –I

SOLUTION OF ALGEBRAIC & TRANSCENDENTAL EQUATIONS

1	a) Find the root of the equation $x^2 - 5 = 0$ by using Bisection method.	[L1][CO1]	**[2M]**
	b) Write the formula to find the root of an equation by Regula Falsi method.	[L1][CO1]	**[2M]**
	c) Write the formula to find the root of an equation by Newton Raphson's method.	[L1][CO1]	**[2M]**
	d) Compare Jacoby and Gauss Seidel methods.	[L5][CO1]	**[2M]**
	e) Solve by Jacoby method [Only two iterations] $\boldsymbol{x + y = 3}$; $\boldsymbol{3x - 2y = 4}$.	[L3][CO1]	**[2M]**
2	a) Find a positive root of the equation $x^3 - x - 1 = 0$ by Bisection method.	[L1][CO1]	**[5M]**
	b) Find out the square root of 25 given $x_0 = 2.0,\ x_1 = 7.0$ using Bisection method.	[L1][CO1]	**[5M]**
3	a) Find a positive root of the equation $x^4 - x - 10 = 0$ by iteration method.	[L1][CO1]	**[5M]**
	b) Solve $x^3 - 2x - 5 = 0$ for a positive root by iteration method.	[L3][CO1]	**[5M]**
4	Find the root of the equation $x\,e^x = 2$ using Regula-falsi method.	[L1][CO1]	**[10M]**
5	Find the root of the equation $x^3 - x - 4 = 0$ using False position method.	[L1][CO1]	**[10M]**
6	Find a real root of the equation $xtanx+1=0$ using Newton – Raphson method.	[L1][CO1]	**[10M]**
7	Find a real root of the equation $e^x sinx = 1$ using Newton – Raphson method.	[L1][CO1]	**[10M]**
8	Solve the following system of equations by Jacobi method $27\boldsymbol{x + 6y - z = 85}$; $\boldsymbol{x + y + 54z = 110}$; $\boldsymbol{6x + 15y + 2z = 72}$.	[L3][CO1]	**[10M]**
9	Solve the following system of equations by Jacobi method $2\boldsymbol{x - 3y + 20z = 25}$; $\boldsymbol{20x + y - 2z = 17}$; $\boldsymbol{3x + 20y - z = -18}$.	[L3][CO1]	**[10M]**
10	Apply Gauss Siedel iteration method to solve equations $\boldsymbol{20x + y - 2z = 17}$; $\boldsymbol{3x + 20y - z = -18}$; $\boldsymbol{2x - 3y + 20z = 25}$.	[L3][CO1]	**[10M]**
11	Solve the following system of equations by Gauss-Siedel method $4\boldsymbol{x + 2y + z = 14}$; $\boldsymbol{x + 5y - z = 10}$; $\boldsymbol{x + y + 8z = 20}$.	[L3][CO1]	**[10M]**

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UNIT –II

INTERPOLATION

1	a) Write Newton's forward interpolation formulae.	[L1][CO2]	**[2M]**
	b) Construct a forward difference table for the function $y = x^2$ for x = 0, 1, 2, 3.	[L1][CO2]	**[2M]**
	c) Write Lagrange's interpolation formulae.	[L1][CO2]	**[2M]**
	d) State the two normal equation used in fitting a straight line.	[L1][CO2]	**[2M]**
	e) Write the normal equations used in fitting a second degree polynomial.	[L1][CO2]	**[2M]**
2	a) Using Newton's forward interpolation formula and the given table of values Obtain the value of *f(x)* when *x=1.6*.	[L3][CO2]	**[5M]**
	b) Applying Newton's forward interpolation formula, compute the value of $\sqrt{5.5}$ given that $\sqrt{5} = 2.236$; $\sqrt{6} = 2.449$; $\sqrt{7} = 2.646$; $\sqrt{8} = 2.828$.	[L3][CO2]	**[5M]**
3	From the following table values of x and *y=tan x*. Interpolate the values of y when *x=0.12* and *x=0.28*.	[L5][CO2]	**[10M]**
4	a) Using Newton's forward interpolation formula and the given table of values Obtain the value of *f(x)* when *x=1.4*.	[L3][CO2]	**[5M]**
	b) Use Newton's backward interpolation formula to find f(32) given f(25)=0.2707, f(30)=0.3027, f(35)=0.3386, f(40)=0.3794.	[L3][CO2]	**[5M]**
5	Using Lagrange's interpolation formula, find the value of y(10) from the following table:	[L3][CO2]	**[10M]**
6	The values of a function f(x) are given below for certain values of x. Find the values of f(2) using Lagrange's interpolation formula.	[L1][CO2]	**[10M]**
7	By method of least squares fit a straight line to the following data ;	[L3][CO2]	**[10M]**
8	Fit a straight line $y = ax + b$ for the following data	[L3][CO2]	**[10M]**

x	1	1.4	1.8	2.2
f(x)	3.49	4.82	5.96	6.5

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

x	1.1	1.3	1.5	1.7	1.9
f(x)	0.21	0.69	1.25	1.89	2.61

x	5	6	9	11
y	12	13	14	16

x	0	1	3	4
y	5	6	50	105

X	1	2	3	4	5
Y	14	27	40	55	68

X	6	7	7	8	8	8	9	9	10
Y	5	5	4	5	4	3	4	3	3

9	Fit a second degree polynomial to the following data by method of least square X: 0, 1, 2, 3, 4 y: 1, 1.8, 1.3, 2.5, 6.3	[L3][CO2]	**[10M]**
10	Obtain a second degree polynomial to the data by method of least square X: 1, 2, 3, 4, 5 Y: 10, 12, 8, 10, 14	[L3][CO2]	**[10M]**
11	Find the curve of best fit of the type $y = ae^{bx}$ to the following data by method of least squares X: 1, 5, 7, 9, 12 Y: 10, 15, 12, 15, 21	[L1][CO2]	**[10M]**

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UNIT –III

SOLUTION OF INITIAL VALUE PROBLEMS TO ORDINARY DIFFERENTIAL EQUATIONS

1	a) Write Taylor's formula for $\boldsymbol{y(x_1)}$ to solve $\boldsymbol{y' = f(x,y)\ with\ y(x_0) = y_0}$.	[L1][CO3]	**[2M]**
	b) State Euler formula to solve $y' = f(x,y),\ y(x_0) = y_0\ at\ x = x_0 + h$.	[L1][CO3]	**[2M]**
	c) Find $y^{(1)}(x)$, by Picard's method, given that $\frac{dy}{dx} = 1 + xy\ ;\ y(0) = 1$.	[L1][CO3]	**[2M]**
	d) If $\frac{dy}{dx} = y - x\ ; y(0) = 2, h = 0.2$ then Find the value of k_1 in R–K method of fourth order.	[L1][CO3]	**[2M]**
	e) Write the formula for Runge – Kutta method of fourth order.	[L1][CO3]	**[2M]**
2	Tabulate $y(0.1), y(0.2)\ and\ y(0.3)$ using Taylor's series method given that $y^1 = y^2 + x$ and $y(0) = 1$	[L3][CO3]	**[10M]**
3	Solve $y^1 = x + y$, given $y\ (1) = 0$ find $y(1.1)\ and\ y(1.2)$ by Taylor's series method.	[L3][CO3]	**[10M]**
4	Find an approximate value of $y\ for\ x = 0.1$ by Picard's method, given that $\frac{dy}{dx} = x + y\ , y(0) = 1$.	[L1][CO3]	**[10M]**
5	Find the values of $\boldsymbol{y(0.1)\ and\ y(0.2)}$ by Picard's method given that $\boldsymbol{y^1 = y - x^2\ , y(0) = 1}$.	[L1][CO3]	**[10M]**
6	Solve by Euler's method $\frac{dy}{dx} = \frac{2y}{x}$ given y(1)=2 and find $y(2)\ \ and\ y(3)$.	[L3][CO4]	**[10M]**
7	Solve by Euler's method $y' = y^2 + x\ ;\ y(0) = 1$.and find y(0.1) and y(0.2)	[L3][CO4]	**[10M]**
8	Using modified Euler's method find $y(0.2) and\ y(0.4),\ given\ y^1 = y + e^x\ , y(0) = 0$	[L3][CO4]	**[10M]**
9	Using Runge – Kutta method of fourth order, compute $y(0.2)$ from $y^1 = xy\ ;\ y(0) = 1,$ taking $h = 0.2$	[L3][CO4]	**[10M]**
10	Using Runge – Kutta method of fourth order, solve $\boldsymbol{\frac{dy}{dx} = x^2 - y,\ y(0) = 1}$. Find $\boldsymbol{(0.1)\ and\ y(0.2)}$.	[L3][CO4]	**[10M]**
11	Using Runge – Kutta method of fourth order, find $y(0.1)\ and\ y(0.2)$ given that $\frac{dy}{dx} = x + y, y(0) = 1$.	[L3][CO4]	**[10M]**

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UNIT –IV
ESTIMATION AND TESTING OF HYPOTHESIS, LARGE SAMPLE TESTS

1	a) Define Population and size of population.	[L1][CO5]	**[2M]**
	b) Define Sample	[L1][CO5]	**[2M]**
	c) Define Estimator.	[L1][CO5]	**[2M]**
	d) Define point of estimator and interval estimator.	[L1][CO5]	**[2M]**
	e) Define unbiased estimator.	[L1][CO5]	**[2M]**
2	a)What is more efficient unbiased estimator?Explain Breifly.	[L4][CO5]	**[5M]**
	b)A random samples of 400 items is found to have mean 82 and S.D of 18. Find the maximum error of estimation at 95% confidence interval.Find the confidence limits for the mean if x = 82.	[L4][CO5]	**[5M]**
3	a) Define Parameters and Statistics.	[L1][CO5]	**[5M]**
	b) The mean and the S.D of a population are 11,795 and 14054 respectively.If n = 50,Find 95% confidence intervals for the mean.	[L4][CO5]	**[5M]**
4	a) A random sample size 81 was taken whose variance is 20.25 and mean is 32,Construct 98% confidence interval.	[L4][CO5]	**[5M]**
	b) Explain procedure for testing a hypothesis.	[L3][CO5]	**[5M]**
5	a) Explain Errors of Sampling.	[L3][CO5]	**[5M]**
	b) Explain characteristics of Estimators.	[L3][CO5]	**[5M]**
6	a)A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40.Test whether the sample has come from a population with mean 38.	[L4][CO5]	**[5M]**
	b) The means of two large samples of sizes 1000 and 2000 members are 67.5inches and 68.0 inches respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches .	[L2][CO5]	**[5M]**
7	a) It is claimed that a random sample of 49tyres has a mean life of 15200 km. This sample was drawn from a population whose mean is 15150kms and standard deviation of 1200 km. Test the significance at 0.05 level.	[L4][CO5]	**[5M]**
	b)Samples of students were drawn from two universities and from their weights in kilograms, mean and standard deviations are calculated and shown below. Make alarge sample test to test thesignificance of the difference between the means.	[L4][CO5]	**[5M]**
8	a) In a random sample of 125 cool drinkers 68 said they prefer thumsup to pepsi. Test thus null hypothesis $P = 0.5$ against the alternative hypothesis is $P > 0.5$	[L4][CO5]	**[5M]**
	b) On the basis of their total scores, 200 candidates of a civil service examination are divided in to two groups, the upper 30% and the remaining 70%.consider the first question of the examination. Among the first group,40 had correct answer, whereas among the second group, 80 had correct answer. On the basis of these results, can one conclude that the first question is not good at discriminating ability of the type being examined here?	[L3][CO5]	**[5M]**
9	a) A die was thrown 9000 times and of these 3220 yielded a 3or 4. Is this consistent with the hypothesis that the die was unbiased?	[L4][CO5]	**[5M]**

	Mean	S.D	ize of the sample
University A	55	10	400
University B	57	15	100

	b)In two large populations, there are 30%, and 25% respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations?	[L4][CO5]	**[5M]**
10	a)Experience had shown that 20% of a manufactured product is of top quality. In one day's production of 400 articles only 50 are of top quality. Test the hypothesis at 0.05 level.	[L4][CO5]	**[5M]**
	b) A sample of 400 items is taken from a population whose standard deviation is 10.The mean of the sample is 40. Test whether the sample has come from a population with mean 38.Also calculate 95% confidence interval for the population.	[L4][CO5]	**[5M]**
11	a)In a big city 325 men out of 600 men were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers?	[L2][CO5]	**[5M]**
	b)A sample of 64 students have mean weight of 70 kgs. Can this be regarded a sample from a population with mean weight 56kgs and standard deviation 25kgs.	[L2][CO5]	**[5M]**

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UNIT-V
LARGE SAMPLE TESTS

1	a) Define Large sample.	[L1][CO6]	**[2M]**
	b) Define Type I error and Type II error.	[L1][CO6]	**[2M]**
	c) Define level of significance.	[L1][CO6]	**[2M]**
	d) Define null hypothesis.	[L1][CO6]	**[2M]**
	e) Define alternate hypothesis.	[L1][CO6]	**[2M]**
2	a) A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not up to the standard.	[L4][CO6]	**[5M]**
	b)A pair of dice are thrown 360 times and the frequency of each sum is indicated below: Sum: 2 3 4 5 6 7 8 9 10 11 12 Frequency: 8 24 35 37 44 65 51 42 26 14 14 Would you say that the dice are fair on the basis of the chi-square test at 0.05 level of significant?	[L5][CO6]	**[5M]**
3	To examine the hypothesis that the husbands are more intelligent than the wives, an investigator took a sample of 10 couples and administered them a test which measures the I.Q. The results are as follows: Husbands: 117 105 97 105 123 109 86 78 103 107 Wives: 106 98 87 104 116 95 90 69 108 85 Test the hypothesis with a reasonable test at the level of significant of 0.05 and also calculate F-test.	[L4][CO6]	**[10M]**
4	A random sample of 10 boys had the following I.Q's : 70,120,110,101,88,83,95,98,107 and 100 a) Do these data support the assumption of a population mean I.Q of 100? b) Find a reasonable range in which most of the mean I.Q values of samples of 10 boys lie.	[L1][CO6]	**[10M]**
5	a)Blood pressure of 5 women before and after intake of a certain drug are given below Before: 110 120 125 132 125 After: 120 118 125 136 121 Test whether the significant change in blood pressure at 1% level of significance.	[L4][CO6]	**[5M]**
	b) In one sample of 8 observations the sum of the squares of deviations of the sample values from the sample was 84,4 and in the other samples of 10 observations it was 102.6. Test whether this difference is significant at 5% level	[L4][CO6]	**[5M]**
6	Two random samples reveal the following results: Sample 1: Size 10, Sample Mean 15, Sum of squares of deviations from the mean 90 Sample 2: Size 12, Sample Mean 14, Sum of squares of deviations from the mean 108 Test whether the samples came from the same normal population.	[L4][CO6]	**[10M]**

7 The nicotine in milligrams of two samples of tobacco were found to be as follows. [L2][CO6] **[10M]**

Sample A	24	27	26	21	25	---
Sample B	27	30	28	31	22	36

Can it be said that the two samples have come from the same normal population.

8 a) A die is thrown 264 times with the following results. Show that the die is biased. (ψ^2 = 11.07 at 5 d.f & 5% L.S) [L2][CO6] **[5M]**

Number on the die	1	2	3	4	5	6
Frequency	40	32	28	58	54	52

b) Scores obtained in a shooting competition by 10 soldiers before and after intensive training are given below: [L4][CO6] **[5M]**

Before	67	24	57	55	63	54	56	68	33	43
After	70	38	58	58	56	67	68	75	42	38

Test whether the intensive training is useful at 0.05 level of significance.

9 a) Find the maximum difference that we can expect with probability 0.95 between the mean of samples of sizes 10 and 12 from a normal population if their standard deviations are found to be 2 and 3 respectively. [L1][CO6] **[5M]**

b)The following table gives the classification of 100 workers according to sex and nature of work. Test whether the nature of work is independent of theworker (ψ^2 = 3.84 at 1d.f) [L4][CO6] **[5M]**

	Stable	Unstable	Total
Males	40	20	60
Females	10	30	40
Total	50	50	100

10 a) Samples of two types of electrical light blubs were tested for length of life and following data were obtained [L2][CO6] **[5M]**

	Type I	Type II
Sample numbers	8	7
Sample mean	1234 hrs	1036 hrs
Sample S.D	36 hrs	40 hrs

Is the difference in the means sufficient to warrant that type I is superior to type II regarding length of life

b)The number of automobile accidents per week in a certain community are as follows: 12, 8, 20, 2, 14, 10, 15, 6, 9, 4. Are these frequencies in agreement with the belief that accident conditions were the same during this 10 week period. [L2][CO6] **[5M]**

11 From the following data, find whether there is any significant liking in the habit of taking soft drinks among the categories of employees. [L1][CO6] **[10M]**

	Employees		
Soft Drinks	Clerks	Teachers	Officers
Pepsi	10	25	65
Thums up	15	30	65
Fanta	50	60	30