| O.P.Code: 23HS0832 | R23 | H.T.No. | | | | | | | | | |
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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**
(AUTONOMOUS)
**B.Tech. II Year I Semester Regular Examinations February-2025**
**NUMERICAL AND STATISTICAL METHODS**
**(Civil Engineering)**

**Time: 3 Hours** **Max. Marks: 70**

**PART-A**
(Answer all the Questions **10 x 2 = 20** Marks)

| | | | | | |
|---|---|---|---|---|---|
| 1 | a | Write the formula to find the root of an equation by Regula Falsi method. | CO1 | L1 | 2M |
| | b | Compare Jacoby and Gauss Seidel methods. | CO1 | L1 | 2M |
| | c | Write Newton's forward interpolation formulae. | CO2 | L1 | 2M |
| | d | Write the normal equations used in fitting a second degree polynomial. | CO2 | L2 | 2M |
| | e | Write Taylor formula for $y(x_1)$ to solve $y^1 = f(x,y)$ *with* $y(x_0) = y_0$. | CO3 | L1 | 2M |
| | f | 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. | CO3 | L2 | 2M |
| | g | Define Population and size of population. | CO4 | L1 | 2M |
| | h | Define unbiased estimator. | CO4 | L1 | 2M |
| | i | Define Type I error and Type II error. | CO5 | L1 | 2M |
| | j | Define Null hypothesis and Alternate hypothesis. | CO5 | L1 | 2M |

**PART-B**
(Answer all Five Units 5 x 10 = 50 Marks)

**UNIT-I**

| | | | | | |
|---|---|---|---|---|---|
| 2 | a | Find a positive root of the equation $x^3 - x - 1 = 0$ by Bisection method. | CO1 | L2 | 5M |
| | b | Solve $x^3 - 2x - 5 = 0$ for a positive root by iteration method. | CO1 | L2 | 5M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 3 | | Solve the following system of equations by Jacobi method $2x - 3y + 20z = 25\,; 20x + y - 2z = 17\,; 3x + 20y - z = -18$. | CO1 | L2 | 10M |

**UNIT-II**

| | | | | | |
|---|---|---|---|---|---|
| 4 | a | Using Newton's forward interpolation formula and the given table values, Obtain the value of *f(x)* when *x=1.6*. | CO2 | L3 | 5M |

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

| | | | | | |
|---|---|---|---|---|---|
| | 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 | CO2 | L3 | 5M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 5 | | Fit a straight line $y = ax + b$ for the following data | CO2 | L2 | 10M |

| x | 6 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| y | 5 | 5 | 4 | 5 | 4 | 3 | 4 | 3 | 3 |

**UNIT-III**

| | | | | | |
|---|---|---|---|---|---|
| 6 | | Tabulate $y(0.1), y(0.2)$ using Taylor's series method given that $y^1 = y^2 + x$ and $y(0) = 1$ . | CO3 | L3 | 10M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 7 | | Using Runge – Kutta method of fourth order, find $y(0.1)$ $and y(0.2)$ given that $\frac{dy}{dx} = x + y, y(0) = 1$. | CO3 | L3 | 10M |

## UNIT-IV

| | | | | | |
|---|---|---|---|---|---|
| 8 | a | What is more efficient unbiased estimator?Explain Breifly. | CO4 | L2 | 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. | CO4 | L2 | 5M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 9 | a | A die was thrown 9000 times and of these 3220 yielded a 3 or 4.Is this consistent with the hypothesis that the die was unbiased? | CO4 | L2 | 5M |
| | 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? | CO4 | L2 | 5M |

## UNIT-V

| | | | | | |
|---|---|---|---|---|---|
| 10 | | 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: | CO5 | L5 | 10M |

| 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.

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 11 | | From the following data, find whether there is any significant liking in the habit of taking soft drinks among the categories of employees. | CO5 | L5 | 10M |

Employees

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

***** END *****