



R22 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

Subject code: 4B2AA

B.Tech II Semester Supplementary Examinations, January 2024

NUMERICAL METHODS AND APPLICATIONS (CIVIL ENGINEERING)

Maximum Marks: 60

Date: 19.01.2024 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks
(10x1M=10Marks)

- | | CO | Bloom |
|--|-----|-------|
| 1. a Define root of an equation. | | Tx |
| b Write the formula of Bisection method. | CO1 | L1 |
| c Write Lagrange's interpolation formula. | CO1 | L1 |
| d Show that $(1 - \nabla)(1 + \Delta) = 1$ | CO2 | L1 |
| e Write the formula of Trapezoidal rule. | CO2 | L1 |
| | CO3 | L1 |
| f Write the formula of Simpson's $\frac{3}{8}$ rule. | CO3 | L1 |
| g Write the formula for Taylor's series method. | CO4 | L1 |
| h Write the formula for Modified Euler's method. | CO4 | L1 |
| i Define Hyperbolic partial Differential Equation. | CO5 | L1 |
| j What is the classification of the equation $f_{xx} + 2f_{xy} + f_{yy} = 0$. | CO5 | L1 |

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 2 Find the positive root of $f(x) = xe^x - 2 = 0$, correct to three decimal places by using Newton - Raphson method. [10M]
CO1 L3
- OR
- 3 Solve by Gauss Jacobi Iterative method (perform 4 iterations only) [10M]
 $x + y + 54z = 110$; $27x + 6y - z = 85$; $6x + 15y + 2z = 72$
CO1 L3
- 4 Using Lagrange interpolation formula, find the value corresponding to $x=3$ from the following table: [10M]
CO2 L3

x	0	1	2	4	5	6
y	1	14	15	5	6	19

OR

- 5 Using Newton divided difference interpolation, find $f(2)$ and $f(-0.5)$ of the given data. [10M] CO2 L3
- | | | | | |
|--------|----|---|---|----|
| x | -1 | 0 | 1 | 3 |
| $f(x)$ | 2 | 1 | 0 | -1 |
- 6 Compute $\left(\frac{dy}{dx}\right)_{x=x_0}$ and $\left(\frac{d^2y}{dx^2}\right)_{x=x_0}$ for the following data [10M] CO3 L4
- | | | | | | | |
|-----|-----|---------|--------|--------|-------|-----|
| x | 3 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 |
| y | -14 | -10.032 | -5.296 | -0.256 | 6.672 | 14 |
- OR
- 7 Evaluate $\int_0^{\pi} \frac{\sin x}{x} dx$ by trapezoidal rule and simpsons 1/3rd rule. Take $n=6$ [5M+5M] CO3 L5
- 8 Using Taylor's series method, find y at $x = 0.1$, if $\frac{dy}{dx} = x^2y - 1$, $y(0) = 1$. [10M] CO4 L3
- OR
- 9 Solve $\frac{dy}{dx} = 1 - y$, $y(0) = 0$, by using modified Euler method and find the values of $y(0.1), y(0.2)$. [10M] CO4 L3
- 10 Solve by implicit Crank-Nicolson's method $U_{xx} = U_t$ for $0 < x < 1, t > 0$ and $U(0, t) = 0, U(1, t) = 0, U(x, 0) = 100(x - x^2)$. Compute U for one time step, $h=1/4$. [10M] CO5 L3
- OR
- 11 Solve the Poisson equation $\nabla^2 u = -10(x^2 + y^2 + 10)$, over the square with sides $x=0, y=0, x=3, y=3$ and $u=0$ on the boundary taking $h=1$. [10M] CO5 L3