R22 Regulation *Subject code: 4B2AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Regular Examinations, September 2023

NUMERICAL METHODS AND APPLICATIONS
(CIVIL ENGINEERING)

Maximum Marks: 60 Date:14.09.2023 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=10 Marks)

1. a Write the formula of Bisection method.
   b Define root of an equation.
   c Prove that $\mu = \frac{1}{2}(E^{\frac{1}{2}} + E^{-\frac{1}{2}})$
   d Show that $\nabla = 1 - E^{-1}$
   e Write the formula of Trapezoidal rule.
   f Write the formula of Simpson's $\frac{1}{3}$rule.
   g Write the formula for Taylor's series method?
   h Write the formula for Modified Euler's method.
   i State Standard Five point formula to solve a Poisson equation of second order.
   j Define Elliptic partial Differential Equation.

Part-B

Answer All the following questions. (5X10M=50Marks)

2 Determine f(x) as a polynomial in 'x' for the following data, using Newton's divided difference formula. [10]

x	-4	-1	0	2	5
y	1245	33	5	9	1325

OR

3 Given the values, y(5) = 150, y(7) = 392, y(11) = 1452, y(13) = 2366, y(17) =5202. Evaluate y(9) using Lagrange's formula. [10]

4 Use Gauss's backward interpolation formula to find f(32) given that f(25) = 0.2707, f(30) = 0.3027, f(35) = 0.3386, f(40) = 0.3794. [10]

OR

5 From the following table of half yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46. [10]

Age x	45	50	55	60	65
Premium y	114.84	96.16	83.32	74.48	68.48

6 Use trapezoidal rule to evaluate $\int_0^1 \frac{1}{1+x^2} dx$, with h=0.2. [10]

OR

7 Evaluate $\int_0^1 e^{-x^2} dx$, by using Simpson 1/3 rule with h = 0.25. [10]

8 Given $\frac{dy}{dx} = y^2 + 3x, y(0) = 1$ Find y(0.1) taking h = 0.1 by using Taylor's series method. [10]

OR

9 Given $\frac{dy}{dx} = x + y^2,\ y(0) = 1$, compute $y(0.1)$ by Runge-Kutta method for fourth order. [10]

10 Apply Bender Schmidt method to solve $y_{tt} = y_{xx}$ $upto\ t = 0.5$ with a spacing of 0.1 subject to $y(0,t) = 0, y(1,t) = 0, y_t(x,0) = 0\ and\ y(x,0) = 10 + x(1-x)$. [10]

OR

11 Solve the differential equation $\frac{d^2y}{dx^2} - y = x$,with $y(0) = 0, y(1) = 0$ with h=1/4 by finite difference method. [10]