R18 Regulation *Subject code:* 2B4AF

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Regular Examinations, July 2021

NUMERICAL METHODS

(Common to CE &ME)

Maximum Marks: 70 Date: 27.07.2021 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
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 **(10x2M=20 Marks)**

1 State the order of convergence and convergence condition for N-R method.
2 Write the procedure to find approximate root of f(x)=0 using bisection method.
3 What is the assumption we make when Lagrange's formula is used?
4 When Newton's backward interpolation formula is used?
5 What is the error in Trapezoidal rule of numerical integration?
6 In order to evaluate by Simpson 1/3 rule, what is the restriction on the number of intervals?
7 State modified Euler algorithm to solve $y' = f(x,y), y(x_0) = y \; at \; x = x_0 + h.$
8 State the disadvantage of Taylor series method.
9 Write the finite difference formula for $\frac{\partial^2 u}{\partial t^2}$.
10 Write down Crank-Nicholson formula to solve $u_t = u_{xx}$.

Part-B

Answer All the following questions. **(10MX 5=50Marks)**

11 Obtain the positive root of $x^3 - x - 2 = 0$ correct to three decimal places by using Newton – Raphson method. (10M)

OR

12 Find the root which lies between (2,3) of $x^3 - 2x - 5 = 0$ by Regula Falsi method. (10M)

13 Using Lagrange interpolation formula, find the polynomial f(x) also find $f(4)$ for the following data. (10M)

$f(0) = 2, f(1) = 3, f(2) = 12, f(15) = 3587.$

OR

14 From the following table of half yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46 and age 63. (10M)

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

15 Using trapezoidal rule, evaluate $\int_0^1 \frac{1}{1+x^2} dx$, with h=0.2. (10M)

OR

16 Evaluate $\int_0^1 e^{-x^2} dx$, using Simpson 1/3 rule with h=0.25. (10M)

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

OR

18 Using Taylor's series method, find y $at\ x = 0.1, if\ \frac{dy}{dx} = x^2y - 1, y(0) = 1$. (10M)

19 Solve $u_{xx} + u_{yy} = 0$ in $0 \leq x \leq 4, 0 \leq y \leq 4$. Given that $u(0,y) = 0$, $u(4,y) = 8 + 2y$, $u(x,4) = x^2$ taking $h = k = 1$. Obtain the result correct o one decimal. (10M)

OR

20 Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$, given that $u(0,t) = u(5,t) = 0, u(x,0) = x^2(25 - x^2)$, find 'u' in the range taking $h = 1$ and upto 3 seconds using Bender – Schmidt recurrence equation. (10M)