



R18 Regulation

Subject code: 2B4AF

**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY**

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

**B.Tech IV Semester Supplementary Examinations, September 2023**

**Numerical Methods**

(Common to CE & ME)

**Maximum Marks: 70**

**Date:26.09.2023 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.
  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 Find any two initial positive roots of the equation  $e^{-x} \sin x = 1$
- 2 Define root of an equation.
- 3 Show that  $\nabla = 1 - E^{-1}$
- 4 Prove that  $(1 + \nabla)(1 - \Delta) = 1$
- 5 Evaluate  $\int_0^1 x^4 dx$  by Trapezoidal Rule taking  $n=4$ .
- 6 Write the formula of Trapezoidal method.
- 7 Find  $y(0.1)$  for  $\frac{dy}{dx} = x - y, y(0) = 1$  Eulers method.
- 8 Write any two demerits of Taylor Series Method
- 9 What is the classification of equation  $f_{xx} + 2f_{xy} + f_{yy} = 0$
- 10 Write Bendre-Schmidt's Recurrence Relations.

**Part-B**

Answer All the following questions.

(5X10M=50Marks)

- 11 Find a positive root of  $x^3 - x - 1 = 0$  by bisection method. (10M)  
OR
- 12 Find a real root of the equation  $x \cdot \log_{10} x = 1.2$  which lies between 2 and 3 by Regula Falsi method. (10M)
- 13 Use Lagranges interpolation formula to fit the unique polynomial  $P(x)$  of degree 2 or less such that  $P(1)=1, P(3)=27, P(4)=64$  (10M)  
OR
- 14 Find  $y(25)$  using Gauss Forward Difference Formula to the following data  
 $y_{20}=24; y_{24}=32; y_{28}=35; y_{32}=40$  (10M)

15 Evaluate  $\int_0^1 \frac{1}{1+x} dx$  by using Simpson's  $\frac{1}{3}$  and  $\frac{3}{8}$  rule with (10M)

$$h = \frac{1}{6}$$

16 Use Trapezoidal rule with  $n=4$  to estimate  $\int_0^1 \frac{1}{1+x^2} dx$  (10M)

OR

17 Apply 4th order Runge-Kutta method to find  $y(0.1)$  given (10M)  
 $y' = xy + y^2, y(0)=1.$

OR

18 Solve  $\frac{dy}{dx} = xy$  using R-K method for  $x=0.2$ , given  $y(0)=1$ , taking  $h=0.2$  (10M)

19 Find the solution of the parabolic equation  $u_{xx}=2u_t$  when  $u(0,t)=u(4,t)=0$  and  $u(x,0)=x(4-x)$  taking  $h=1$ . Find the values upto  $t=5$  (10M)

OR

20 Evaluate the pivotal values of the equation  $u_{tt}=16u_{xx}$ , taking  $h=1$  upto  $t=1.25$ . The boundary conditions are  $u(0,t)=u(5,t)=0, u_t(x,0)=0$  and  $u(x,0)=x^2(5-x)$  (10M)