



R18 Regulation

Subject code:2B4AF

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, December 2025

NUMERICAL METHODS

(Common to CE & ME)

Maximum Marks: 70

Date:30.12.2025

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)		Marks	CO	BTL
1	Explain about Bisection method	2M	1	L1
2	Find any two initial positive roots of the equation $xe^x = 2$	2M	1	L1
3	Show that $\nabla = 1 - E^{-1}$	2M	2	L1
4	Prove that $E^{1/2} = \mu + \frac{\delta}{2}$	2M	2	L1
5	Evaluate $\int_0^1 x^4 dx$ by Trapezoidal Rule taking n=4	2M	3	L1
6	Evaluate $\int_0^1 \frac{1}{1+x} dx$ by Simpson's Rule by taking n=4	2M	3	L1
7	Find y(0.1) for $\frac{dy}{dx} = x - y, y(0) = 1$ Eulers method.	2M	4	L1
8	Using R-K method to evaluate y(0.1) given that $y' = xy, y(0) = 1$.	2M	4	L1
9	Find whether the following equation is Elliptic or hyperbolic $(x + 1)u_{xx} - 2(x + 2)u_{xy} + (x + 3)u_{yy} = 0$.	2M	5	L1
10	Write the explicit scheme for the solution of wave equation.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Find a positive root of $x^3 - x - 1 = 0$ by bisection method.	10M	1	L2
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	1	L2
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	2	L2
OR				

14	Find the polynomial to the following data by Newton's Divided Difference Formula, hence find $f(4)$	10M	2	L2												
	<table border="1"> <tr> <td>X</td> <td>0</td> <td>2</td> <td>3</td> <td>6</td> </tr> <tr> <td>y</td> <td>648</td> <td>704</td> <td>729</td> <td>792</td> </tr> </table>	X	0	2	3	6	y	648	704	729	792					
X	0	2	3	6												
y	648	704	729	792												
15	Find $f'(1.72)$ and $f'(1.76)$ for the table given below	10M	3	L2												
	<table border="1"> <tr> <td>x</td> <td>1.72</td> <td>1.73</td> <td>1.74</td> <td>1.75</td> <td>1.76</td> </tr> <tr> <td>y</td> <td>0.17907</td> <td>0.17728</td> <td>0.17552</td> <td>0.17377</td> <td>0.17204</td> </tr> </table>	x	1.72	1.73	1.74	1.75	1.76	y	0.17907	0.17728	0.17552	0.17377	0.17204			
x	1.72	1.73	1.74	1.75	1.76											
y	0.17907	0.17728	0.17552	0.17377	0.17204											
OR																
16	Use Trapezoidal rule with $n=4$ to estimate $\int_0^1 \frac{1}{1+x^2} dx$	10M	3	L2												
17	Solve $\frac{dy}{dx} = x^2 + y, y(0) = 1$ by Modified Eulers method and compute $y(0.2), y(0.4)$.	10M	4	L2												
OR																
18	Given $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$ Evaluate $y(0.1)$ & $y(0.2)$ using Eulers modified method.	10M	4	L2												
19	Solve the Poisson equation $u_{xx} + u_{yy} = -81xy, 0 < x < 1, 0 < y < 1$ given that $u(0,y)=0, u(x,0)=0, u(1,y)=100, u(x,1)=100$ and $h=1/3$	10M	5	L2												
OR																
20	Solve the partial differential equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square with sides $x=0=y, x=3=y$ with $u=0$ on the boundary and mesh length=1	10M	5	L2												