



R20 Regulation

Subject code: 3B3AA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Supplementary Examinations, December 2025

NUMERICAL METHODS

(CE)

Maximum Marks: 70

Date: 15.12.2025

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	Find any two initial positive roots of the equation $e^x \sin x = 1$.	2M	1	L1
2	Define root of an equation.	2M	1	L1
3	If the interval of differencing is unity prove that $\Delta[x(x+1)(x+2)(x+3)] = 4(x+1)(x+2)(x+3)$.	2M	2	L1
4	Show that $\Delta = E - 1$.	2M	2	L1
5	Evaluate $\int_0^1 x^3 dx$ by Trapezoidal Rule taking $n=4$.	2M	3	L1
6	Derive Newton's forward difference formula for dy/dx at $x = x_0$.	2M	3	L1
7	Evaluate $\int_0^{\pi/2} e^{\sin x} dx$ taking $h = \pi/6$.	2M	4	L1
8	Find $y(1.1)$ by Taylo's series method for the IVP $dy/dx = x+y, y(1) = 0$.	2M	4	L1
9	Write Runge=kutta fourth order formula.	2M	5	L1
10	Write the explicit method and implicit method.	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 RegulaFalsi method.	10M	1	L2														
13	Find $f(2.5)$ Using Newton's Forward Formula from the following table	10M	2	L2														
<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>y</td> <td>1</td> <td>16</td> <td>81</td> <td>256</td> <td>625</td> <td>1296</td> </tr> </table>					x	0	1	2	3	4	5	y	1	16	81	256	625	1296
x	0	1	2	3	4	5												
y	1	16	81	256	625	1296												
OR																		
14	Find the value of y at $x = 1936$ by using Gauss's Backward interpolation formula from the following table.	10M	2	L2														
<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>1901</td> <td>1911</td> <td>1921</td> <td>1931</td> <td>1941</td> <td>1951</td> </tr> <tr> <td>Y</td> <td>12</td> <td>15</td> <td>20</td> <td>27</td> <td>39</td> <td>52</td> </tr> </table>					X	1901	1911	1921	1931	1941	1951	Y	12	15	20	27	39	52
X	1901	1911	1921	1931	1941	1951												
Y	12	15	20	27	39	52												

15	Find the first and second derivatives of the function tabulated below at the point $x=1.5$	10M	3	L2												
		<table border="1"> <tr> <td>X</td> <td>1.5</td> <td>2.0</td> <td>2.5</td> <td>3.0</td> <td>3.5</td> <td>4.0</td> </tr> <tr> <td>Y</td> <td>3.375</td> <td>7.0</td> <td>13.625</td> <td>24.0</td> <td>38.875</td> <td>59.0</td> </tr> </table>			X	1.5	2.0	2.5	3.0	3.5	4.0	Y	3.375	7.0	13.625	24.0
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Y	3.375	7.0	13.625	24.0	38.875	59.0										
OR																
16	Evaluate $\int_0^1 \sqrt{1+x^4} dx$ using Simpson's 3/8 rule.	10M	3	L2												
17	Given $dy/dx = -xy^2$, $y(0) = 2$ Compute $y(0.2)$ in steps of 0.1 using modified Euler's method.	10M	4	L2												
OR																
18	Using Runge-kutta method for $\frac{dy}{dx} = \frac{y^2-x^2}{y^2+x^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$	10M	4	L2												
19	Use the Bender-Schmidst recurrence relation to solve the equation $u_{xx}=2u_t$ with the conditions $u(x,0) = 4x - x^2$, $u(0,t)=u(4,t)=0$.	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												