



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 2024**

**NUMERICAL METHODS**

(Civil Engineering)

Maximum Marks: 70

Date: 02.12.2024

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)		CO	Bloom Tx
1	Find two initial positive roots of the equation $e^x \sin x = 1$	1	L1
2	Define root of an equation	1	L1
3	If the interval of differencing is unity prove that $\Delta[x(x+1)(x+2)(x+3)] = 4(x+1)(x+2)(x+3)$	2	L1
4	$(1 - \nabla)(1 + \Delta) = 1$	2	L1
5	Write Stirling's formula to find the derivate of a function?	3	L1
6	Evaluate $\int_0^1 x^3 dx$ by using Trapezoidal rule, with $n = 3$ .	3	L1
7	Define initial and boundary value problems.	4	L1
8	Write Rungekutta fourth order formula.	4	L1
9	Explain explicit method and implicit method.	5	L1
10	Classify the PDE $u_{xx} + 2xu_{xy} + (1-y^2)u_{yy} = 0$ .	5	L1

**Part-B**

Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx														
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 Regular Falsi 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	Determine $f(x)$ as a polynomial in 'x' for the following data, using Newton's divided difference formula [10M]	2	L2														
<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>-4</td> <td>-1</td> <td>0</td> <td>2</td> <td>5</td> </tr> <tr> <td>y</td> <td>1245</td> <td>33</td> <td>5</td> <td>9</td> <td>1325</td> </tr> </table>				x	-4	-1	0	2	5	y	1245	33	5	9	1325		
x	-4	-1	0	2	5												
y	1245	33	5	9	1325												

15	Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ by using (i) Trapezoidal rule (ii) Simpson's 1/3 rule. [10M]	3	L2
OR			
16	Evaluate $\int_0^\pi \frac{\sin x}{x} dx$ using $n = 6$ , by a) Trapezoidal rule b) Simpson's 1/3 rule [10M]	3	L2
17	Given $\frac{dy}{dx} = y^2 + 3x, y(0) = 1$ Find $y(0.1)$ taking $h = 0.1$ by using Taylor's series 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