R22 Regulation *Subject code:4B2AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Supplementary Examinations, June 2026

NUMERICAL METHODS AND APPLICATIONS

(CE)

Maximum Marks: 60 Date: 15.06.2026 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 (10X1M=10 Marks)		Marks	CO	BTL
1.a	Write the formula Bi-Section method.	1M	1	1
b	Define root of an equation.	1M	1	1
c	Write the relation between the operators E and D.	1M	2	1
d	Show that $\Delta = E-1$.	1M	2	1
e	Determine 'h' value to solve $\int_0^6 \frac{1}{1+x} dx$ when n=6	1M	3	2
f	Write formula of simpson's 3/8 rule.	1M	3	1
g	Define initial and boundary value problems.	1M	4	1
h	Write Runge-Kutta fourth order formula.	1M	4	1
i	State Standard five point formula.	1M	5	1
j	Classify the equation $u_{xx} + 4u_{xy} + (4y^2 + x^2)u_{yy}$=Sin (x+y).	1M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Find a positive real root of $2x - 3 \sin x = 5$ near 3 decimals by Newton Raphson method.	10M	1	2
	OR			
3	Find a positive real root of the equation $e^x \sin x = 1$ upto 3 decimals by RegulaFalsi method.	10M	1	3
4	Find Y(1.5) Using Newton's Forward Formula from the following table	10M	2	2

X	0	1	2	3	4	5
Y	1	16	81	256	625	1296

	OR			
5	Find the value of y at x =1936 by using Gauss's Backward interpolation formula from the following table.	10M	2	3

X	1901	1911	1921	1931	1941	1951
Y	12	15	20	27	39	52

6	Find the first derivitaves at x=1.4 from the following data. X: 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 Y: 0 | 0.128 | 0.544 | 1.296 | 2.432 | 4	10M	3	3
	OR			
7	Evaluate $\int_0^{\pi} \frac{sinx}{x} dx$ using n = 6, by a) Trapezoidal rule b) Simpson's 1/3 rule.	10M	3	2
8	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	2
	OR			
9	Apply 4th order Runge-Kutta method to find y(0.1) given $y' = xy$, y(0) =1.	10M	4	3
10	Solve the heat equation $\frac{\partial^2 U}{\partial X^2} = \frac{\partial u}{\partial t}$ subject to the condition U(x,0) = 0, U(0,t) =0, U(1,t)= t then find U two steps in t-direction taking h=$\frac{1}{4}$ by crank Nicolson method.	10M	5	2
	OR			
11	Solve the heat equation $\frac{\partial^2 U}{\partial X^2} = \frac{\partial u}{\partial t}$, given that U(0,t) = U(5,t) = 0 and U(x,0) = $x^2(25-x^2)$. Find the U in the range taking h=1 upto 3 seconds by using Bender-Schmidt method.	10M	5	3