Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 20010

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. 2026
Fourth Semester
Electrical and Electronics Engineering
U23MA407 – NUMERICAL METHODS
(Regulation 2023)

Time : Three Hours Maximum : 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Solve $2x + y = 3$; $7x - 3y = 4$ by Gauss Jordan method.	2	K2	CO1
2.	State Newton Raphson formula.	2	K1	CO1
3.	State any two properties of divided difference.	2	K1	CO2
4.	State Newton's backward difference formula.	2	K1	CO2
5.	Evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$ by two point Gaussian formula.	2	K2	CO3
6.	State Simpson's $\frac{1}{3}$ rule.	2	K1	CO3
7.	What are the demerits of the Taylor's series method?	2	K1	CO4
8.	Is predicator correction a self-starting method? How many prior values are required in predictor-corrector formulae?	2	K2	CO4
9.	Write the difference between explicit and implicit scheme of solution of one dimensional heat flow equation.	2	K1	CO5
10.	Write the difference scheme for solving the Laplace equation.	2	K2	CO5

PART – B

(5 x 16 = 80 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Solve the following system of equations by Gauss seidel method $27x + 6y - z = 85, \quad x + y + 54z = 110,$ $6x + 15y + 2z = 72.$	8	K3	CO1
		ii.	Solve the system of equations by Gauss elimination method $x + 2y + z = 3, \quad 2x + 3y + 3z = 10,$ $3x - y + 2z = 13.$	8	K3	CO1
			(OR)			
	b)	i.	Find the largest eigenvalue and corresponding eigenvector of $\begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$, by using power method.	8	K3	CO1
		ii.	Find the root of $x^3 - 2x - 5 = 0$ by the fixed point iteration method, correct to four decimal places.	8	K3	CO1
12.	a)	i.	Using Newton's divided difference formula, find f (x) from the following data and hence find f (4) .	8	K2	CO2

x:	0	1	2	5
f (x):	2	3	12	147

ii.	From the following data, find y at x =43 using Newton's interpolation formula.					
x	40	50	60	70	80	90
y	184	204	226	250	276	304

(OR)

b) The following values of x and y are given: 16 K4 CO2

x :	1	2	3	4
y :	1	2	5	11

Find the cubic splines and evaluate $y(1.5)$.

13.	a)	i.	Use Gaussian three –point formula to evaluate $\int_1^5 \frac{dz}{z}$ and compare with exact value.	8	K3	CO3
		ii.	Using Romberg's integration to evaluate $I = \int_0^1 \frac{dx}{1+x}$ correct to four decimal places by taking h = 0.5, 0.25 & 0.125 .	8	K3	CO3
			(OR)			

b) i. Evaluate $\int_0^1\int_0^1 \frac{1}{(1+x+y)}dxdy$ by Simpson's rule with h = k = 0.5. — 8 — K4 — CO3

ii. The following data gives the velocity of a particle for 20 seconds at different time intervals of duration 5 seconds. Find the initial acceleration using the entire data — 8 — K4 — CO3

Time(sec.)	0	5	10	15	20
Velocity (m/sec.)	0	3	14	69	228

14. a) Given $\frac{dy}{dx}=1-y$ and y(0)=0, find — 16 — K4 — CO4

i. y(0.1) by Taylor series method.

ii. y(0.2) and y(0.3) by Euler's method.

iii. y(0.4) by Milne's method.

(OR)

b) i. Using Runge-Kutta method of 4th order, solve $\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2}$ with y(0) = 1 at x = 0.2. — 8 — K4 — CO4

ii. Using Taylor series method find y at x = 0.1 if $\frac{dy}{dx}=x^2y-1, y(0)=1$ — 8 — K4 — CO4

15. a) Solve the Poisson equation $\nabla^2 u=-10(x^2+y^2+10)$ over the square with sides x=0,y=0,x=3,y=3 with u=0 on the boundary, taking h=1. — 16 — K5 — CO5

(OR)

b) Find the numerical solution of the parabolic equation $\frac{\partial^2 u}{\partial x^2}=2\frac{\partial u}{\partial t}$ when u(0,t) = 0 = u(4,t) and u(x,0) = x(4-x) by taking h = 1. Find the values upto t = 5. — 16 — K5 — CO5