Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May/June 2026

Date: 15– 05-2026 **Time:** 09:30am – 12:30pm

School: SOE	**Program:** B. Tech.	
Course Code: MAT2502	**Course** Name: Numerical Methods and Complex Variables	
Semester: IV	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	12	14	14	12	14	34

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M = 20M**

1	Define a transcendental equation with one example.	2 Marks	L2	CO1
2	Verify the system of equations $5x + y - z = 2,\ x + 3y + z = 1$ and $3x - y + 5z = 3$ diagonally dominant or not.	2 Marks	L2	CO2
3	Define Rayleigh power method and when it fails to converge.	2 Marks	L2	CO2
4	Write the interpolation formulae for equal intervals.	2 Marks	L1	CO3
5	Write the normal equations to fit a parabola?	2 Marks	L1	CO3
6	What is the condition for applying Simpson's 1/3 rule and Simpson's 3/8 rule.	2 Marks	L1	CO4
7	Define modified Euler's method and What is the initial condition required in this method.	2 Marks	L2	CO5
8	Write the expressions of k_3 & k_4 in Runge-Kutta method of fourth order.	2 Marks	L1	CO5
9	Define analytic function with one example.	2 Marks	L2	CO6
10	Verify whether the function $u = xy$ is harmonic.	2 Marks	L2	CO6

Part B

Answer the Questions. **Total Marks 80M**

11	Apply Newton Raphson method to compute a real root of the equation $\boldsymbol{x - e^{-x} = 0}$ correct to three decimal places.	10 Marks	L3	CO1
	Or			
12	Use fixed point -Iteration method to find a negative root of the equation $x^3 - 2x + 5 = 0$ correct to four decimal places.	10 Marks	L3	CO1

13	Apply Gauss-Seidel iteration method to solve the equations $\boldsymbol{10x + y + z = 12}$, $\boldsymbol{2x + 10y + z = 13}$ and $\boldsymbol{2x + 2y + 10z = 14}$ (Perform four iterations).	10 Marks	L3	CO2
	Or			
14	Use LU decomposition method to find the lower and upper triangular matrix for the system of equations $x + y + z = 1$, $4x + 3y - z = 6$ and $3x + 5y + 3z = 4$.	10 Marks	L3	CO2

15	The following data gives the melting point of an alloy of lead and zinc, where t is the temperature in deg-C and p is the percentage of lead in the alloy. p: 40, 50, 60, 70, 80, 90 t: 184, 204, 226, 250, 276, 304 Apply Newton's interpolation formula, find the melting point of the alloy containing (i) 44 percent of lead (ii) 84 percent of lead.	10 Marks	L3	CO3
	Or			
16	Use the method of least squares to fit a curve of the form $y = ab^x$ for the following data and hence find the estimation for y when $x = 8$. x: 1, 2, 3, 4, 5, 6, 7 y: 87, 97, 113, 129, 202, 195, 193	10 Marks	L3	CO3

17	The velocity $\boldsymbol{v}$ (km/min) of a moped which starts from rest, is given at fixed intervals of time $\boldsymbol{t}$ (min) as follows: t: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 v: 10, 18, 25, 29, 32, 20, 11, 5, 2, 0 Calculate approximately the distance covered in 20 minutes using Simpson's 1/3rd rule.	10 Marks	L3	CO4
	Or			
18	Solve $\int_0^1 \frac{dx}{1+x^2}$ taking seven ordinates by applying (i) Trapezoidal rule (ii) Simpson's 1/3rd rule (iii) Simpson's 3/8th rule.	10 Marks	L3	CO4

19	Apply Modified Euler's method, find $\boldsymbol{y(0.2)}$ given $\frac{dy}{dx} = y + e^x$, $y(0) = 0$ (carry out computations correct to 4 decimal places, with step length h = 0.2).	10 Marks	L3	CO5
	Or			
20	Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx} = 3x + \frac{y}{2}$, y(0) = 1 at $x = 0.1$ with step length h = 0.1 (carry out computations correct to 4 decimal places).	10 Marks	L3	CO5

21	Use the Cauchy-Riemann equations to prove that $f(z) = e^z$ is analytic function and hence find $f'(z)$.	10 Marks	L3	CO6
	Or			
22	Apply the transformation to obtain the image of $\|z - 1\| = 1$ in the complex plane under the mapping $w = 1/z$.	10 Marks	L3	CO6

23	Use the Cauchy–Riemann equations to determine the analytic function $f(z) = u + iv$ whose real part is $u(x, y) = x^3 - 3xy^2 + 3x^2 - 3y^2$.	10 Marks	L3	CO6
	Or			
24	Apply Cauchy's integral formula to evaluate $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ Where C is the circle $\|z\| = 3$.	10 Marks	L3	CO6

25	Use the Laurent's series expansion to express the function $f(z) = \frac{1}{(z-1)(z-2)}$ in the following regions: 1. $1 < \|z\| < 2$ 2. $\|z\| > 2$.	10 Marks	L3	CO6
	Or			
26	Apply Cauchy's residue theorem, evaluate the integral $\int_C \frac{z\cos z}{(z-\pi/2)^3} dz$ where C is the circle $\|z - 1\| = 1$.	10 Marks	L3	CO6