

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURAJADA VIZINAGARAM

II B. Tech I Semester Regular/Supply Examinations, November – 2025

COMPLEX VARIABLES AND NUMERICAL METHODS

(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A, Part B.**Part A is compulsory, Answer all questions.**In Part B, Answer any one question from each unit.*

PART-A

(20 Marks)

- 1 a) Determine whether $f(z) = \frac{1}{2} \log(x^2 + y^2) + i \tan^{-1}(y/x)$ is analytic [2]
- b) Check the continuity of $f(z) = z^2$ [2]
- c) Classify the singularity of $f(z) = e^{1/z}$ at $z = 0$ [2]
- d) Find the residue of $f(z) = \frac{z}{(z-1)(z+2)}$ at $z = 1$ [2]
- e) Find the existence of root of the equation $xe^x = 1$ [2]
- f) Find $\Delta(e^{2x})$ if $h = 2$ [2]
- g) Define Numerical differentiations [2]
- h) Write the normal equations $y = a + bx$ [2]
- i) Find first approximation using Picard's method given that $\frac{dy}{dx} = 1 + xy, y(0) = 1$ [2]
- j) Find $y''(0), y'''(0)$ for $\frac{dy}{dx} = x + y^2, y(0) = 1$ [2]

PART-B

(50 Marks)

Unit-1

- 2 Find "k" such that $u(x, y) = x^3 + 3kxy^2$ is Harmonic and find its Conjugate [10]
- (OR)
- 3 Show that $f(z) = \begin{cases} \frac{(x^3+y^3)+i(x^3+y^3)}{x^2+y^2}, & \text{if } z \neq 0 \\ 0, & \text{if } z = 0 \end{cases}$ [10]

Is not analytic at $z = 0$ although C-R equations are satisfied at origin.

Unit-2

- 4 Evaluate $\int_C \frac{e^z}{z^2+1} dz$ where $C: |z| = 1$ using Cauchy's integral formula [10]
- (OR)
- 5 Find Taylor's expansion $f(z) = \frac{z}{(z+1)(z+2)}$ about the point $z = -2$ [10]

Unit-3

- 6 Find the real root of $x^3 - x^2 + 100 = 0$ using Iteration method [10]
- (OR)
- 7 Find the interpolating polynomial $y(x)$ for the following data using Lagrange's method hence find $y(15)$. [10]

x	10	13	14	16	18
Y(x)	2	4	5	8	12

Unit-4

- 8 Fit the curve $y = a + bx + cx^2$ for the following data [10]

x	0	1	2	3	4
y(x)	1	0	3	10	21

(OR)

- 9 Evaluate $\int_0^2 e^{3x} dx$ using (i) Trapezoidal (ii) Simpson's 1/3rd rule and compare with exact solution [10]

Unit-5

- 10 Find $y(0.1), y(0.2)$ using Modified Euler's method in terms of $h = 0.1$ given that that $\frac{dy}{dx} = 3x + y^2, y(0) = 1$ [10]

(OR)

- 11 Find $y(0.1), y(0.2)$ using RK method of second order method given that that $\frac{dy}{dx} = 2x - y^2, y(0) = 1$ [10]
