

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA VIZIANAGARAM

II B. Tech I Semester Regular Examinations, November – 2024

Complex Variables & Numerical Methods

(Common to EEE)

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) Evaluate $\lim_{z \rightarrow 1} \frac{z^2 + z - 2}{z - 1}$ [2]
- b) Show that An Analytic function with constant Real part is constant [2]
- c) Evaluate $\oint_C (x^2 - y^2 + 2ixy)dz$ where C is the contour $|z|=1$ [2]
- d) Find the singularity of $f(z) = \tan 1/z$ [2]
- e) Find the interval existence of the root $x^3 - 4x + 9 = 0$ [2]
- f) Prove that $\Delta = E - 1$ [2]
- g) Write and Simpson's 3/8th rule [2]
- h) Write the normal equations for $y = ae^{bx}$ [2]
- i) Find $y(0.1)$ using Euler's method given that $\frac{dy}{dx} = x - y^2, y(0) = 1$ [2]
- j) Write the merits of Taylor's series method [2]

PART-B

(50 Marks)

Unit-1

- 2 Show that $u(x, y) = e^{-2xy} \sin(x^2 - y^2)$ is harmonic, find its conjugate [10]

(OR)

- 3 Show that for $f(z) = \begin{cases} \frac{(x^3 - y^3) + i(x^3 + y^3)}{x^2 + y^2} if & z \neq 0 \\ 0 & if & z = 0 \end{cases}$ [10]

 $f^1(z)$ does not exist at origin although C-R equations are satisfied at the origin

Unit-2

- 4 a) Evaluate $\int_{(0,0)}^{(1,1)} [3x^2 + 5y + i(x^2 - y^2)]dz$ along $y^2 = x$ [5]
- b) Expand $f(z) = 1/z$ about $z = -1$ using Taylor's theorem [5]

(OR)

- 5 a) Evaluate $\int_C \frac{e^{2z}}{z-2} dz$ where C is $|z| = 1$ using Cauchy's integral formula [5]
- b) Compute the poles and residue of $f(z) = \frac{ze^z}{(z-1)^3}$ [5]

Unit-3

- 6 Find the real root of the equation $x = \cos x$ using bisection method [10]

(OR)

- 7 a) Evaluate $\sqrt{28}$ using iteration method [5]
- b) Find $y(0.5)$ using newton forward interpolation formula from the data [5]

x	0	1	2	3
y	1	3	7	13

Unit-4

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

x	1	2	3	4	5
Y	10	12	8	10	14

(OR)

- 9 Evaluate $\int_0^1 \frac{1}{1+x} dx$ using Trapezoidal and Simpson's 1/3rd rule [10]

Unit-5

- 10 Find $y(1.1)$ & $y(1.2)$ using Picard's method given that $\frac{dy}{dx} = 2x - y, y(1) = 3$ [10]

(OR)

- 11 Find $y(1.2), y(1.4)$ using RK method of fourth order given that $\frac{dy}{dx} = xy, y(1) = 2$ [10]
