

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech I Semester Regular/Supplementary Examinations, December-2024**NUMERICAL METHODS AND COMPLEX VARIABLES****(COMMON TO EEE & ECE)****Time: 3 Hours****Max. Marks: 60****Section – A (Short Answer type questions)****(10 Marks)****Answer All Questions**

	Course Outcome	B.T Level	Marks														
1. Write the formula of Fourier sine transform of $f(x)$	CO1	L1	1M														
2. Find the term independent of x in the Half Range Cosines series of $f(x) = x$ in $(0, \pi)$	CO1	L1	1M														
3. Find the positive interval (root) in which the root of $x^3 - 9x + 1 = 0$ lies.	CO2	L2	1M														
4. Construct backward difference table for the following data:	CO2	L2	1M														
<table border="1"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>y</td> <td>-5</td> <td>1</td> <td>9</td> <td>25</td> <td>55</td> <td>105</td> </tr> </table>				x	0	1	2	3	4	5	y	-5	1	9	25	55	105
x	0	1	2	3	4	5											
y	-5	1	9	25	55	105											
5. Using Euler's method find $y(0.1)$, given that $y' = x^2 - y$, $y(0) = 1$	CO3	L3	1M														
6. Write formula of Simpson's $3/8^{\text{th}}$ rule	CO3	L1	1M														
7. Define Bilinear transformation	CO4	L1	1M														
8. Find whether the function $2xy + i(x^2 - y^2)$ is analytic	CO4	L1	1M														
9. Mention the types of singular points	CO5	L1	1M														
10. State Cauchy Integral Theorem	CO5	L1	1M														

Section B (Essay Questions)**Answer all questions, each question carries equal marks.****(5 X 10M = 50M)**

11. A) Find the Fourier series to represent $x + x^2$ in $(-\pi, \pi)$ and deduce that $1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots = \frac{\pi^2}{6}$
- OR**
- B) Find the Fourier transform of $f(x) = \begin{cases} 1, & \text{for } |x| < 1 \\ 0, & \text{for } |x| > 1 \end{cases}$.
- Hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$
12. A) Find the positive real root of the equation $x^3 - 5x - 7 = 0$ by the Newton – Raphson method.
- OR**
- B) Given $\sin 45^\circ = 0.7071$, $\sin 50^\circ = 0.7660$, $\sin 55^\circ = 0.8192$ and $\sin 60^\circ = 0.8660$, find $\sin 52^\circ$ using Newton's forward interpolation formula
13. A) Evaluate $\int_0^2 e^{-x^2} dx$ by using (i) Trapezoidal rule (ii) Simpson's $1/3^{\text{rd}}$ rule taking $h = 0.25$
- OR**
- B) Using Runge-Kutta method of fourth order, find y at $x = 1.1$ given that $2y' = 2x^3 + y$, $y(1) = 2$.

14. A) Using Milne Thomson method construct the analytic function whose real part is $\frac{y}{x^2+y^2}$ CO4 L3 10M
- OR**
- B) Find the Bilinear transformation which maps the points $Z = -1, 0, 1$ to $W = 0, i, 3i$. CO4 L2 10M
15. A) Evaluate $\oint_C \frac{4-3z}{z(z-1)(z-2)} dz$ where C is the circle $|z| = \frac{3}{2}$ using Cauchy residue theorem CO5 L3 10M
- OR**
- B) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent's series valid for $1 < |z| < 3$ CO5 L3 10M