R22

ANURAG Engineering College
(An Autonomous Institution)
II B.Tech I Semester Regular Examinations, Jan/Feb– 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.	State Dirichlet's conditions for a function to be expanded as a Fourier series.	CO1	L1	1M
2.	Define Fourier transform.	CO1	L1	1M
3.	Write the main difference between Jacobi's and Gauss-seidal?	CO2	L1	1M
4.	Write Gauss Forward formula	CO2	L1	1M
5.	Use the trapezoidal rule evaluate : $\int_{1}^{2}\frac{1}{1+x}dx$ with h=0.6	CO3	L1	1M
6.	Find y(1) Use the Eulers formula for $\frac{dy}{dx}=xy$, with y(0)=1	CO3	L1	1M
7.	Write Cauhcy's Riemann Equations in polar coordinates	CO4	L1	1M
8.	Check $u(x,y)=x^2-y^2$ is Harmonic function or not	CO4	L1	1M
9.	Explain Isolated Essential Singularity of a complex function f(z)	CO5	L1	1M
10.	State Cauchy's Integral Theorem	CO5	L1	1M

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

11. A)	Obtain Fourier series expansion for *f(x)* defined as follows $$f(x)=x+\frac{\pi}{2},-\pi<x\leq 0$$ $$f(x)=\frac{\pi}{2}-x,0\leq x>\pi$$	CO1	L2	10M

OR

B)	Obtain the Fourier cosine transform of $\frac{e^{-ax}}{x}$	CO1	L3	10M

12. A)	Obtain a root of the equation $f(x)=x^3-5x+1$ using Bisection method.	CO2	L2	10M

OR

B)	The following data gives the melting points of an alloy of lead and zinc:	CO2	L3	10M

Percentage of lead in the alloy(p):	5	6	9	11
Temperature(Q°c):	12	13	14	16

Determine the melting point of the alloy containing 10% of lead, using appropriate Lagrange's interpolation formula.

13. A) Evaluate $\int_{0}^{10} \frac{dx}{1-x^3}$ by using   CO3   L2   10M

     i) Trapezoidal rule   ii) simpson's 3/8 rule with h = 1.

OR

B) Apply Runge-Kutta method of fourth order, find an approximate   CO3   L3   10M

     value of y for x = 0.2 insteps of 0.1 if $\frac{dy}{dx} = x + y^2$ given that y=1,

     when x=0

14. A) If $w = \phi + i\psi$ represents the complex potential for an electric field   CO4   L2   10M

     and $\psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$ determine the function ϕ.

OR

B) Obtain the bilinear transformation that maps $z_1 = 0, z_2 = -1, z_3 = \infty$ CO4   L3   10M
     into the points $w_1 = -1, w_2 = -2-i, w_3 = i$ respectively. Also determine the
     fixed points of the transformation.

15. A) Evaluate, using Cauchy's integral formula $\oint_C \frac{e^z}{z^2+1} dz$ where C is the   CO5   L2   10M

     circle $|z| = 3$

OR

B) Expand $f(z) = \frac{1}{(z+1)(Z+3)}$ in Laurent series valid for   CO5   L3   10M

     $(i)\ 1 < |z| < 3$ $(ii)\ 0 < |z+1| < 2$