R15

ANURAG Engineering College
(An Autonomous Institution)
II B.Tech I Semester Supplementary Examinations, June/July – 2024
MATHEMATICS – IV
(COMMON TO EEE & ECE)

Time: 3 Hours   **Max. Marks: 75**

Section – A (Short Answer type questions)   (25 Marks)
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Write Fourier sine integral formulae.	CO1	L1	2M
2.	Compute the finite Fourier sine transform of $f(x) = x(\pi - x)$, in $0 < x < \pi$.	CO1	L1	3M
3.	Write Cauchy Riemann equations in polar coordinates.	CO2	L1	2M
4.	Find k such that $u(x, y) = x^3 + 3kxy^2$ may be Harmonic.	CO2	L1	3M
5.	Define essential singularity.	CO3	L1	2M
6.	Expand e^z as Taylors series about z=1.	CO3	L1	3M
7.	State Residue theorem.	CO4	L1	2M
8.	Find the residue of $f(z) = \frac{z^2}{(z-2)(z-3)}$ at $z = 3$.	CO4	L1	3M
9.	Define conformal mapping.	CO5	L1	2M
10.	Find the fixed points of the mapping $w = (5z + 4)/(3z - 7)$	CO5	L1	3M

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

			Course Outcome	B.T Level	Marks
11.	A)	Find the Fourier transform of $f(x) = 1 - x^2, if|x| \le 1 = 0, if|x| > 1$. Hence show that $\int_0^\infty \frac{x \cos x - \sin x}{x^3} dx = \frac{\pi}{4}$	CO1	L3	10M
		OR			
	B)	Find the Fourier sine transform of $e^{-ax}, a > 0$ and hence deduce the inversion formula.	CO1	L2	10M
12.	A)	Prove that the function f(z) defined by $f(z) = \frac{x^3(i+1) - y^3(1-i)}{x^2 + y^2}$ $(z \ne 0)$, $f(0) = 0$ is continuous and the Cauchy-Riemann equations are satisfied at origin.	CO2	L3	10M
		OR			
	B)	Verify that $u = e^x \cos y$ is harmonic in the complex plane and find a conjugate harmonic function.	CO2	L2	10M
13.	A)	Evaluate using Cauchy's theorem $\int_C \frac{z^3 e^{-z}}{(z-1)^3} dz$ where C is $|z-1| = \frac{1}{2}$	CO3	L3	10M

B) Expand $f(z) = \dfrac{1}{(z-1)(z-2)}$ in the region $1<|z|<2$. CO3 L3 10M

14. A) Evaluate $\displaystyle\int_c \dfrac{4-3z}{z(z-1)(z-2)}\,dz$ where c is the circle $|z|=\dfrac{3}{2}$ CO4 L3 10M

B) Show that $\displaystyle\int_0^{2\pi} \dfrac{d\theta}{a+b\cos\theta} = \dfrac{2\pi}{\sqrt{a^2-b^2}}$ (a>b>0) CO4 L2 10M

15. A) Under the transformation w=1/z find the image of the circle $|z-2i|$ =2. CO5 L2 10M

B) Find the bilinear transformation that maps the points $z_1=1$, $z_2=i$ $z_3=$ -1 onto points $w_1=i, w_2=0$ $w_3=$ -i CO5 L3 10M