QP Code: R252G032 Reg. No | | | | | | | | | | | AY 24

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET UNIVERSITY)

M.Sc. (Second Semester - Regular) Examinations, July – 2025

24MPCMA12002 – Complex Analysis

(Mathematics)

Time: 3 hrs Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	What is the value of $\lim_{z\to 2i}(3x + iy^2)$.	CO1	K1
b.	Find the fixed points of $f(z) = z^2$.	CO3	K3
c.	Show that derivative of $(\bar{z})$ does not exist any where	CO2	K2
d.	Evaluate $\int(\bar{z})^2 dz$ around the circle |z|=1.	CO2	K1
e.	Draw the figure of $\|z\| = a$.	CO1	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	State and prove Cauchy-Reimann Equation.	5	CO1	K5
b.	Show that the function $f(z) = 4xy - x^3 + 3xy^2$ Harmonic and also find its Harmonic Conjugate	5	CO1	K5
	(OR)			
c.	Prove that the function $\|z^2\|$ is continuous everywhere but nowere differentiable except at origin	5	CO1	K2
d.	Find the bilinear transformation which maps the points z_1=2,z_2=i,z_3=-2 onto w_1=1,w_2=i,w_3=-1 respectively.	5	CO2	K5
3.a.	State and proof Liouville's theorem.	5	CO3	K6
b.	Using Cauchy integral formula evaluate $\int \frac{\cosh(\pi z)}{z(z-1)} dz$ over the circle |z|=2.	5	CO2	K5
	(OR)			
c.	Determine the number of zeros of the polynomial $P(z) = z^{10} - 6z^7 + 3z^3 + 1$ in$\|z\| < 1$.	5	CO2	K1
d.	State and proof Cauchy integral theorem.	5	CO2	K2
4.a.	Find the radii of convergence $(i)\ \sum \frac{n!}{n^n} z^n \ \ (ii) \sum \frac{z^n}{n^2}$.	5	CO5	K3
b.	Prove that $\int_{-\infty}^{\infty} \frac{x^4}{x^6-1} dx = \frac{\pi\sqrt{3}}{6}$.	5	CO4	K2
	(OR)			
c.	If z, w be two complex numbers such that $\bar{z}w \neq 1$ and |z|<1, |w|<1. Prove that $\left\|\frac{\{z-w\}}{\{1-\bar{z}w\}}\right\| < 1$.	5	CO3	K3
d.	Determine the region of the w- plane into which each of following is mapped by the transformation w=iz+1, (i) x>0; 0<y<2 of the z-plane.	5	CO2	K2
5.a.	Expand $f(z) = \frac{1}{z}$ in a Taylor's series about $z = 1$.	4	CO6	K3

b.	Evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{5+4cos\theta} d\theta.$	6	CO6	K3
	(OR)			
c.	If f(z) $= \frac{z+4}{(z+3)(z-1)^2}$, find Laurent's series expand in , a) $0 < \|z-1\| < 4$ b) $\|z-1\| > 4$	5	CO6	K3
d.	State and prove Maximum Modules theorem.	5	CO4	K2
6.a.	Prove that $\int_0^{\infty} \frac{cos\ mx}{a^2+x^2}\ dx = \frac{\pi}{2a}\ e^{-ma},\ m \geq 0.$	5	CO4	K3
b.	Find the poles of f(z) $= \frac{z^2+4}{z^3+2z^2+2z}$ and determine the residue at pole	5	CO5	K3
	(OR)			
c.	Find the singularities and write which type of singularity of given function $f(z) = \frac{z-sinz}{z^3}$.	5	CO6	K3
d.	State and prove Cauchy's Residue theorem.	5	C04	K2

--- End of Paper ---