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

M.Sc. (Second Semester - Regular) Examinations, May - 2026

24MPCMA12002 –Complex Analysis (Mathematics)

Time: 3 hrs

Maximum: 60 Marks

Answer ALL questions
(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. Determine and sketch the sets in complex plane (i) $Im Z \geq 0$ (ii) $\pi/6 < arg Z < \pi/4$.	CO1	K3
b. What is the image of $\frac{1-i}{\sqrt{2}}$ on the sphere.	C03	K3
c. Define uniformly convergence and also write Harmonic series.	CO2	K2
d. Find the singularity and classify $f(z) = \frac{\sin z}{z}$	CO2	K2
e. State Liouville's theorem.	C01	K1

PART – B**(10 x 5 = 50 Marks)**Answer **ALL** the questions

	Marks	CO #	Blooms Level
2. a. Prove that the function $ z^2 $ is continuous everywhere but nowhere differentiable except at origin	5	CO1	K5
b. Show that the function $v(x) = x^4 - 6x^2y^2 + y^4$ Harmonic and also find its Harmonic Conjugate. Construct the corresponding Analytic function.	5	CO1	K5
(OR)			
c. State and prove Cauchy-Reimann Equation. And also show that an analytic function on a region with constant modulus is constant.	10	CO1	K2
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	K4
d. State and proof Cauchy integral theorem.	5	C02	K5
4.a. Find the radii of convergence (i) $\sum \frac{(n+1)}{(n+2)(n+3)} z^n$ (ii) $\sum \left(1 - \frac{1}{n}\right)^{n^2} z^n$.	5	CO5	K3
b. Prove that Evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos\theta} d\theta$.	5	C04	K2
(OR)			
c. Map the function $w = \sin z$ in the complex.	10	C03	K4
5.a. Expand $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ in a Taylor's series in $ z < 2$.	4	CO6	K3
b. Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$.	6	CO6	K3
(OR)			
c. If $f(z) = \frac{z+4}{(z+3)(z-1)^2}$, find Laurent's series expand in ,	5	CO6	K3

a) $0 < |z - 1| < 4$ b) $|z - 1| > 4$

- d. State and prove Schwarz Lemma. 5 CO4 K2
 6.a. Prove that $\int_0^\infty \frac{x^4}{x^6 - 1} dx = \frac{\sqrt{3}\pi}{6}$. 10 CO4 K5

(OR)

- b. Find the zeros and discuss the nature of singularities of $f(z) = \frac{z-2}{z^2} \sin \frac{1}{z-1}$. 5 CO6 K3
 Find the singularities and write which type of singularity of given function
 $f(z) = \frac{z - \sin z}{z^3}$.

- c. State and prove Argument theorem. 5 CO4 K5

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