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GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR (GIET UNIVERSITY)

M.Sc. (Third Semester - Regular) Examinations, December – 2024

22MTPE303– Complex Analysis

(M.Sc.- Mathematics)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A

Q.1. Answer ***ALL*** questions

		CO #	Blooms Level
a.	Write the Cauchy-Riemann equations in polar coordinates.	CO1	K1
b.	Verify whether the function is Analytic or not. F(z) $=\frac{2}{z^2}$	CO1	K2
c.	Define harmonic function with an example	CO1	K2
d.	State Cauchy's integral formula	CO2	K2
e.	Evaluate $\oint_c \frac{dz}{(z+2)}$ $where \quad c: \|z\| = 1$	CO2	K2
f.	Define Laurent series of a function f(z).	CO3	K2
g.	Define Residue of a function f(z).	CO3	K2
h.	Find centre and radius of convergence of $\sum \frac{1}{n(n+1)} (z-2)^n$	CO4	K2
i.	Define invariant points of bilinear transformation	CO4	K2
j.	Define conformal mapping.	CO4	K1

PART – B

(10 x 5=50 Marks)

<u>Answer ***ANY FIVE*** the questions</u>

		Marks	CO#	Blooms Level
2. a.	Prove that an analytic function of constant absolute value is constant.	5	CO1	K3
b.	Find the conjugate harmonic of V= $-e^{-x}$ siny by using C-R Conditions	5	CO1	K3
3.a.	Find an analytic function whose real part is u = $x^3 - 3x^2y + x^2 - y^2$	5	CO1	K3
b.	State and prove morera's theorem	5	CO1	K3
4. a.	State and prove Cauchy's Integral theorem	5	CO2	K3
b.	Find the line integral over the curve $\oint_c z\,dz$; c is the shortest path from 1+i to 2+3i.	5	CO2	K3
5.a.	Find the Laurent series of $\frac{z^2}{(z-1)(z-2)}$, $valid\ in\ the\ region\ 1 \le \|z\| \le 2$.	5	CO2	K3
b.	Solve the integral $\int_{-\infty}^{\infty} \frac{1}{(x^2+4)(x^2+9)} dx$	5	CO3	K3
6. a.	Evaluate $\oint \frac{e^z+z}{z^3-z} dz$ c : $\|z\| = \frac{\pi}{2}$ by residue theorem.	5	CO3	K3
b.	Evaluate $\int_0^{2\pi} \frac{d\theta}{2+cos\theta}$.	5	CO3	K3
7.a.	Find the image of the infinite strip i) $2 \le y \le 4$ ii) under the mapping w= $\frac{1}{z^2}$	5	CO4	K3
b.	Find the bilinear transformation which maps the points (∞, i,0) into the points(0, i, ∞)	5	CO4	K3

8. a.	Evaluate $\oint \frac{z^2 \sin z}{4z^3-1} dz$; c : $\lvert z\rvert = 2$ by residue theorem	5	CO2	K3
b.	expand f(z)= $\frac{1}{z^2}$ about Z= i in Taylor's series up to 4^{th} derivative terms	5	CO2	K3

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