BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSC **SEMESTER : II**
BRANCH: MATH. AND COMPUTING **SESSION : SP/2025**

SUBJECT: MA110R1 COMPLEX ANALYSIS

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	If $f(z)$ has a finite limit at z_0, then prove that $f(z)$ is a bounded function in some neighborhood of z_0.	[5]	CO1	4
Q.1(b)	Derive Cauchy-Riemann equation in Polar form.	[5]	CO1	3
Q.2(a)	Evaluate $\oint_C z^2 dz$, where C is the arc of the circle |z|=2 and $\theta = 0$ *to* $\theta = \pi/3$.	[5]	CO2	2
Q.2(b)	State and prove Cauchy integral formula.	[5]	CO2	3
Q.3(a)	Define Taylor's series. Find a Taylor's series expansion of $f(z) = \frac{2z^3+1}{z^2+z}$ about the point $z = i$.	[5]	CO3	4
Q.3(b)	Expand the function $f(z) = \frac{1}{(z-1)(z-2)(z-3)}$ for $1 < \|z\| < 3$. Also, find the nature of singularities of the given function.	[5]	CO3	3
Q.4(a)	Evaluate the integral $\int_0^{2\pi} \frac{d\theta}{1+\alpha \cos\theta}$, $\alpha > 1$.	[5]	CO4	4
Q.4(b)	Evaluate the integral $\int_0^{\infty} \frac{x^2+2}{(x^2+1)(x^2+4)} dx$.	[5]	CO4	3
Q.5(a)	Find the image of the closed unit disc $\|z\| \leq 1$ under the mapping $w = (1-i)z - 2i$.	[5]	CO5	3
Q.5(b)	Prove that a Bilinear transformation maps circles into circles.	[5]	CO5	4

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