BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2024)

CLASS: IMSc **SEMESTER : II**
BRANCH: MATHEMATICS & COMPUTING **SESSION : SP/2025**

SUBJECT: MA110R1 COMPLEX ANALYSIS

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	For the complex number $z = 1 - 2i$, find r and θ such that $z = re^{i\theta}$.	[2]	CO1	BT1
Q.1(b)	Express the function $f(z) = z + z^3$ in the form $U(x,y) + i\,V(x,y)$. Is $f(z)$ analytic?	[3]	CO1	BT2
Q.2(a)	Use Cauchy-Riemann equations to check the differentiability of the function $f(z) = x\,cosy + i\,siny$.	[2]	CO1	BT3
Q.2(b)	Find a harmonic conjugate of the function $u(x,y) = e^x \sin y$	[3]	CO1	BT1
Q.3(a)	State and prove Cauchy integral theorem.	[2]	CO2	BT4
Q.3(b)	Let C be the positively oriented unit circle $\|z\| = 1$. Evaluate $\int_C \frac{e^{bz}}{z^2} dz$ for any real constant b.	[3]	CO2	BT1
Q.4	State and prove Taylors series.	[5]	CO2	BT4
Q.5	Give two Laurent series that represents the function $f(z) = \frac{1}{z^2(1-z)}$ in the domains $0 < \|z\| < 1$ and $1 < \|z\| < \infty$.	[5]	CO3	BT1

::::::28/02/2025::::::M