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

CLASS: IMSC **SEMESTER : 1ST**
BRANCH: MATHEMATICS & COMPUTING **SESSION : MO/2025**

SUBJECT: MA102 REAL 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)	Define least upper bound of a set. Give one example.	[2]	CO1	1
Q.1(b)	Find the supremum, infimum and limit point of the following set A and B: $A = \{x \in \mathbb{R} : x^2 < 4\}$ $B = \left\{1 + \frac{(-1)^n}{n} : n \in \mathbb{N}\right\}$	[3]	CO1	2
Q.2(a)	Define an interior point of a set. Give one example.	[2]	CO1	2
Q.2(b)	Disprove the following statement by giving the counter examples: "The intersection of an infinite number of open sets in $\mathbb{R}$ is not necessarily open."	[3]	CO1	2
Q.3(a)	Define convergent of sequence. Give one example.	[2]	CO2	2
Q.3(b)	Examine the sequence $a_n = \frac{2n+1}{n+1}$ is monotonic, bounded and convergent.	[3]	CO2	3
Q.4(a)	Show that the sequence $\{(-1)^n\}$ is not a Cauchy sequence.	[2]	CO2	2
Q.4(b)	Prove that a convergent sequence is a Cauchy sequence.	[3]	CO2	3
Q.5(a)	State p-series test. Give one example.	[2]	CO3	1
Q.5(b)	Check that the series $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$ is convergent or divergent by finding the sequence of partial sum.	[3]	CO3	2

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