BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2023)

CLASS: IMSc | **SEMESTER : I**
BRANCH: QEDS | **SESSION: MO/2023**

SUBJECT: ED101 INTRODUCTORY 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

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			CO	BL
Q.1(a)	Show that the set $\left\{1,-1,1\frac{1}{2},-1\frac{1}{2},1\frac{1}{3},-1\frac{1}{3},\ldots\right\}$ is closed but not open.	[2]	CO1	1,2
Q.1(b)	Prove that $\sqrt{t}$, where t is a prime number, is an irrational number.	[3]	CO1	1,2
Q.2(a)	Define countable set. Give an example a set which is countable.	[2]	CO1	1
Q.2(b)	Find the supremum, infimum, greatest element and least element, if exist, of the set $S=\left\{-\frac{1}{n}+[1+(-1)^n]n^2, n\geq 1\right\}$.	[3]	CO1	1,2
Q.3(a)	Using $\epsilon-\delta$ definition show that $\lim\limits_{n\to\infty}\frac{3+2\sqrt{n}}{\sqrt{n}}=2$.	[2]	CO2	2
Q.3(b)	State Cauchy's general principle of convergence. Using Cauchy's general of convergence show that the sequence $\left\{1+\frac{1}{2!}+\frac{1}{3!}+\cdots+\frac{1}{n!}\right\}$ is convergent.	[1+2]	CO2	2,3
Q.4(a)	Prove or give a counter example for the statement: "All the subsequences of a divergent sequence are divergent".	[2]	CO2	2,3
Q.4(b)	Check the convergency of the series $\sum_{n=1}^{\infty}\frac{n^n}{(n+1)(n+2)\cdots(2n)}$.	[3]	CO2	3
Q.5	Test for the convergency of the infinite series $$1+\frac{3}{7}x+\frac{3.6}{7.10}x^2+\frac{3.6.9}{7.10.13}x^3+\cdots, x>0.$$	[5]	CO2	3

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