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

CLASS: B.TECH / IMSC
BRANCH: ALL / PHYSICS

SEMESTER : I
SESSION : MO/2023

SUBJECT: MA103 MATHEMATICS-I

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)	Discuss the convergence of the sequence $< \frac{n}{n^2+1} >$. Cgt	[2]	CO1	1
Q.1(b)	Test the convergence of the series: $\sum_{n=1}^{\infty} \sqrt{\frac{n}{2(n+1)}}$. dgt	[3]	CO1	2
Q.2(a)	Using the Cauchy's integral test, examine the convergence of the series: $\sum_{n=1}^{\infty} n\, e^{-n^2}$. cgt	[2]	CO1	2
Q.2(b)	Apply the Leibnitz's test, check the convergence of the series: $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{3n-2}$. cgt	[3]	CO1	2
Q.3(a)	Find the rank of the matrix: $\begin{pmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{pmatrix}$. 2	[2]	CO2	2
Q.3(b)	Test the consistency of the system of equations: $2x - 3y + 7z = 5;\ 3x + y - 3z = 13;\ 2x + 19y - 47z = 32$. inconsistent	[3]	CO2	3
Q.4	Find the eigenvalues and eigenvectors of the matrix: $\begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{pmatrix}$. $A = 2,3,5$ $P = \begin{pmatrix} -1 & 1 & 2 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$	[5]	CO2	3
Q.5(a)	Show that limit of the function: $\lim_{(x,y)\to(0,0)} \frac{x^2-y^2}{x^2+y^2}$ does not exist. ✓	[2]	CO3	2
Q.5(b)	Find the partial derivatives $f_x(0,0)$ and $f_y(0,0)$ of the function: $f(x,y) = \frac{x^3-y^3}{x^2+y^2},\ (x,y) \neq (0,0)$.	[3]	CO3	2

:::::13/10/2023:::::