BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/SP20)**

CLASS: BTECH / IMSc. **SEMESTER : I**
BRANCH: ALL / FT **SESSION : MO/22**

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)	Find whether the sequence $\{a_n\}$ is monotonically increasing, bounded and convergent or not. $a_n = \frac{3n}{n+1}$ for all $n \in N$	[2]	CO1	1
Q.1(b)	Test the convergence of the series $5 - \frac{10}{3} + \frac{20}{9} - \frac{40}{27} + ...$	[3]	CO1	5
Q.2(a)	Find whether the following series is convergent or not $\sum_{n=1}^{\infty} \frac{(n - \ln n)^n}{2^n . n^n}$	[2]	CO1	1
Q.2(b)	Test the convergence of the series $1 + \frac{3}{7}x + \frac{3.6}{7.10}x^2 + \frac{3.6.9}{7.10.13}x^3 + ...(x > 0)$	[3]	CO2	5
Q.3(a)	$A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & b \end{bmatrix}$. Find for which value of b, rank of A is 3	[2]	CO2	2
Q.3(b)	Find for which real value of b the following equations have a non zero solution x + 2y + 3z = bx , 3x + y + 2z = by and 2x + 3y + z = bz	[3]	CO2	2
Q.4(a)	Can the vector (7, 7, 9, 11) be expressed as a linear combination of vectors (2, 0, 3, 1) , (4, 1, 3, 2) and (1, 3, -1, 3)? If, so, find the linear combination.	[2]	CO2	3
Q.4(b)	Applying Cayley Hamiltonian theorem find A^{-1}. A = $\begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$	[3]	CO2	3
Q.5(a)	Evaluate whether following limit exists or not. $\lim_{(x,y)->(0,0)} \frac{xy^4}{x^2 + y^8}$	[2]	CO3	1
Q.5(b)	If $u = x^y$; check whether $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial x}$ or not.	[3]	CO2	3

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