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

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		CO	BL

Q.1(a) Find whether the sequence $\{a_n\}$ is monotonically increasing, bounded and [2] CO1 1
convergent or not. $a_n = \dfrac{3n}{n+1}$ for all $n \in N$

Q.1(b) Test the convergence of the series $5 - \dfrac{10}{3} + \dfrac{20}{9} - \dfrac{40}{27} + \dots$ [3] CO1 5

Q.2(a) Find whether the following series is convergent or not $\sum_{n=1}^{\infty} \dfrac{(n - \ln n)^n}{2^n . n^n}$ [2] CO1 1

Q.2(b) Test the convergence of the series [3] CO2 5
$1 + \dfrac{3}{7}x + \dfrac{3.6}{7.10}x^2 + \dfrac{3.6.9}{7.10.13}x^3 + \dots (x > 0)$

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 [3] CO2 2
solution

$x + 2y + 3z = bx$, $3x + y + 2z = by$ and $2x + 3y + z = bz$

Q.4(a) Can the vector (7, 7, 9, 11) be expressed as a linear combination of vectors [2] CO2 3
(2, 0, 3, 1) , (4, 1, 3, 2) and (1, 3, -1, 3)? If, so, find the linear
combination.

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. $\lim_{(x,y) \to (0,0)} \dfrac{xy^4}{x^2 + y^8}$ [2] CO3 1

Q.5(b) If $u = x^y$; check whether $\left(\dfrac{\partial^3 u}{\partial x^2 \partial y}\right) = \dfrac{\partial^3 u}{\partial x \partial y \partial x}$ or not. [3] CO2 3

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