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1st Class Test (CA3)

Paper Name: Mathematics IB **Paper Code: BS M102** **Dept.: ME**

Full Marks: 25 **Time: 50 Minutes** **Date: 12.12.2022**

<u>Group A</u> (Answer any five questions) **(5x1=5)**

1. (i) The inverse of $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is

a) $\frac{1}{2}\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$ b) $\frac{1}{2}\begin{bmatrix} -4 & 2 \\ -3 & 1 \end{bmatrix}$ c) $\frac{1}{2}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$ d) $\frac{1}{2}\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$ [CO5, E]

(ii) If the matrix $\begin{pmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ \lambda & -3 & 0 \end{pmatrix}$ is singular, then find the value of λ is

a) 1 b) -1 c) -2 d) 2 [CO5, E]

(iii) If $AA^T = I$, then

a) $\det A = 0$ b) $\det A = 1$ c) $(\det A)^2 = 1$ d) None of these [CO5, P]

(iv) Which one of the following is not a lower bound of the sequence $\{3 + \sin x\}$

a) 1 b) 2 c) -2 d) 3 [CO3, U]

(v) Indicate the correct statement from the following: [CO3, R]

a) A bounded sequence is convergent b) A monotonic sequence is convergent

c) A bounded and monotonic sequence is convergent d) A convergent sequence may not be bounded

(vi) The Series $1 + 2 + 3 + 4 + 5 + \dots\dots$ is [CO3, A]

a) Convergent b) Divergent c) Conditionally convergent d) none of these

<u>Group B</u> (Answer any two questions) **(2x5=10)**

2. Using Laplace's method of expansion, prove that

$$\begin{vmatrix} x & y & z & w \\ -y & x & w & -z \\ -z & -w & x & y \\ -w & z & -y & x \end{vmatrix} = (x^2 + y^2 + z^2 + w^2)^2.$$ [CO5, A]

3. Examine the consistency of the following system of equations and solve:

$$2x - 2y - 4z = 8$$
$$2x + 3y + 2z = 8$$
$$-x + y - z = 7/2$$ [CO5, E]

4. Verify Cayley-Hamilton theorem for $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{pmatrix}$. Hence compute A^{-1}. [CO5, U]

<u>Group C</u> (Answer any two questions) **(2x5=10)**

5. Test whether the series is convergent or not $\left(\frac{2^2}{1^2} - \frac{2}{1}\right)^{-1} + \left(\frac{3^3}{2^3} - \frac{3}{2}\right)^{-2} + \left(\frac{4^4}{3^4} - \frac{4}{3}\right)^{-3} + \dots$ [CO3, E]

6. Prove that series $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots\dots(-1)^{n+1}\frac{x^n}{n} + \dots\dots\infty$ is absolutely convergence when $|x| < 1$ and conditionally convergent when x=1. [CO3, U]

7. Examine the convergence and divergence of the series $1 + \frac{x}{2} + \frac{x^2}{5} + \frac{x^3}{10} + \dots\infty$ [CO3, P]