

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)
END SEMESTER EXAMINATION-DECEMBER 2019
B.Sc(Nautical Science)
Semester – IV
Applied Mathematics-VI
(UG21T2403)

Date: 16.12.2019

Max Marks: 70

Time: 3 Hrs

Pass Marks : 35

Note: Answer any Seven Questions out of Nine Questions.
All questions carry equal marks.

Q.1 a) Test for consistency of the following equations and solve them if they are consistent.

$$2x - 3y + 7z = 5, \quad 3x + y - 3z = 13, \quad 2x + 19y - 47z = 32 . \quad (5 \text{ Marks})$$

b) Prove that the following matrix is orthogonal and hence find A^{-1} .

$$A = \frac{1}{3} \begin{bmatrix} -2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & -2 & 2 \end{bmatrix} \quad (5 \text{ Marks})$$

Q.2 a) Show that the matrix $A = \frac{1}{2} \begin{bmatrix} \sqrt{2} & -i\sqrt{2} & 0 \\ i\sqrt{2} & -\sqrt{2} & 0 \\ 0 & 0 & 2 \end{bmatrix}$ is unitary and hence find A^{-1} .

(5 Marks)

b) Reduce the following matrix to normal form and find its rank. (5 Marks)

$$A = \begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ 5 & 3 & 3 & 11 \end{bmatrix}$$

Q.3 Find non-singular matrices P and Q such that $A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$ is reduced

to normal form. Also find its rank. (10 Marks)

Q.4 Verify Cayley Hamilton theorem for the matrix A and hence find A^{-1} and A^4

where $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$. (10 Marks)

Q.5 a) If $A = \begin{bmatrix} 2+i & 3 & -1+3i \\ -5 & i & 4-2i \end{bmatrix}$, show that AA^* is a hermitian matrix, where

A^* is the conjugate transpose of A . (5 Marks)

b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$. (5 Marks)

Q.6 a) Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = \cos x \cdot \cos 2y$ (5 Marks)

b) Solve $yz p + zx q = xy$. (5 Marks)

Q.7 a) Solve $p^2 + q^2 = x + y$ (5 Marks)

b) Solve $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial z}{\partial y} - z = e^{-x}$. (5 Marks)

Q.8 a) Form a partial differential equation by eliminating the arbitrary function from $z = (x + y) \varphi(x^2 - y^2)$. (5 Marks)

b) Solve the equation $\frac{\partial^2 z}{\partial x^2} = xy$. (5 Marks)

Q.9 Solve the equation $2x^2 r - 5xy s + 2y^2 t + 2(px + qy) = 0$. (10 Marks)
