

Indian Maritime University
(A Central University, Govt of India)
B.SC (Nautical Science)
May/June 2018 End Semester Examinations
Semester IV
Applied Mathematics-VI- UG21T2403

Time: 3 Hours

Max Marks: 70

Date: 08.06.2018

Pass Marks: 35

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

1 a) Test for consistency and solve:

$$2x + 6y + 11 = 0, 6x + 20y - 6z + 3 = 0, 6y - 18z + 1 = 0. \quad (5 \text{ Marks})$$

b) Verify that the following matrix is orthogonal: $\begin{bmatrix} \frac{1}{3} & \frac{2}{3} & \frac{2}{3} \\ \frac{2}{3} & \frac{1}{3} & \frac{-2}{3} \\ \frac{2}{3} & \frac{-2}{3} & \frac{1}{3} \end{bmatrix}$ (5 Marks)

2 a) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 4 & 3 \\ 2 & 9 \end{bmatrix}$. (5 Marks)

b) Show that the following matrix is unitary: $\frac{1}{\sqrt{3}} \begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix}$. (5 Marks)

3 Reduce the matrix $A = \begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to the diagonal form. (10 Marks)

4 a) Using Cayley Hamilton theorem find the inverse of $\begin{bmatrix} 1 & 1 & 2 \\ 0 & -2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$. (5 Marks)

b) Reduce the following matrix to the normal form and hence find its rank,

$$\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$$

(5 Marks)

5 a) Find the characteristics equation of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ and hence find its inverse. (5 Marks)

b) Solve $\frac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x + 3y)$ (5 Marks)

6 a) Solve $(z - y)p + (x - z)q = y - x$. (5 Marks)

b) Solve $p^2 + q^2 = x + y$. (5 Marks)

7 a) Solve $q - xp = p^2$ (5 Marks)

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

8 a) Solve the equation $(D - D' - 1)(D - D' - 2)z = e^{2x-y}$ (5 Marks)

b) Form a partial differential equation by eliminating the arbitrary function from : $z = f(x^2 - y^2)$ (5 Marks)

9 Solve the equation $r - t \cos^2 x + p \tan x = 0$. (10 Marks)