INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

End Semester Examination December 2017

Programme Name: B.Sc (Nautical Science) **Semester**: IV

Subject Name: Applied Mathematics-VI **Subject Code**: UG21T2403

Date: 29.12.2017 **Maximum Marks**: 70

Time: 3 Hours **Pass: Marks**:35

NOTE: Attempt any FIVE questions out of 7. All questions carry equal marks. Use of approved type Scientific Calculator is allowed.

(5 X 14 = 70 Marks)

1. a) Test for consistency and solve,

$$2x + 6y + 11 = 0\,, 6x + 20y - 6z + 3 = 0\,, 6y - 18z + 1 = 0.$$

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

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

2. a) Verify Cayley-Hamilton theorem for the matrix A and find its inverse:

$$\boldsymbol{A} = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}.$$

b) Show that the following matrix is unitary, $\begin{bmatrix} \frac{2+i}{3} & \frac{2i}{3} \\ \frac{2i}{3} & \frac{2-i}{3} \end{bmatrix}$.

3. a) Find the eigen values and eigen vectors for the matrix, $\begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$.

b) Verify that the following matrix is orthogonal: $\begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{bmatrix}$.

4. a) Find non-singular matrices P and Q such that PAQ is in the normal form for the

matrix: $A = \begin{bmatrix} 1 & -1 & -1 \\ 1 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

b) Solve $\frac{\partial^2 z}{\partial y \partial x} = xy$.

5. a) Solve $(mz - ny)\frac{\partial z}{\partial x} + (nx - lz)\frac{\partial z}{\partial y} = ly - mx$.

b) Solve $2xz - px^2 - 2qxy + pq = 0$.

6. a) Solve the following equation: $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$.

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

7. a) Solve $(x-y)(xr - xs - ys + yt) = (x+y)(p-q)$.

b) Solve $xp + yq = 3z$.

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