

SET B

SUBJECT: Applied Mathematics -I

Mark: 20

Q.1 Attempt any five out of six.

- a. Test for consistency  $x - 2y + 3z = 2, 2x + y + z + t = -4, 4x - 3y + z + 7t = 8$  2
- b. Solve  $x + 2y + 3z = 0, 2x + 3y + z = 0, 4x + 5y + 4z = 0, x + 2y - 2z = 0$  2
- c. Prove that matrix  $\begin{bmatrix} \frac{1+i}{2} & \frac{-1+i}{2} \\ \frac{1+i}{2} & \frac{1-i}{2} \end{bmatrix}$  is unitary. 2

d. Reduce the following matrix to echelon form & find its rank

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

2

e. If  $x = \frac{1}{2}(u^2 - v^2), y = uv, z = w$  Find  $\frac{\partial(x,y,z)}{\partial(u,v,w)}$  2

f. Find  $\frac{\partial z}{\partial x}$  &  $\frac{\partial z}{\partial y}$  for  $z^3 - xy + yz + y^3 - 2 = 0$  at  $(1,1,1)$  2

Q.2 Attempt any one out of two.

a. Solve following equation by Gauss Jordan method. 5

$$x + y + z = 5, 2x + 3y + z = 10, 3x - 2y + 2z = 3$$

OR

$$P \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 2 \end{bmatrix} Q \begin{bmatrix} 1 & 2 & 2 \\ 0 & 0 & 1 \\ 0 & 1 & 2 \end{bmatrix}$$

b. Find non singular matrices P & Q s.t PAQ is in normal form Also find

rank &  $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$  5

Q.3 Attempt any one out of two.

a. Verify Euler's theorem for  $u = ax^2 + 2hxy + by^2$  5

OR

b. If  $u = f\left(\frac{x-y}{xy}, \frac{z-x}{zx}\right)$  P.T  $x^2 \frac{\partial u}{\partial x} + y^2 \frac{\partial u}{\partial y} + z^2 \frac{\partial u}{\partial z} = 0$  5