

General Instructions to the students

- 1 Place your Permanent / Temporary Student ID card on the desk during the examination for verification by the Invigilator.
- 2 Reading material such as books (unless open book exam) are not allowed inside the examination hall.
- 3 Borrowing writing material or calculators from other students in the examination hall is prohibited.
- 4 If any student is found indulging in malpractice or copying in the examination hall, the student will be given 'F' grade for the course and may be debarred from writing other examinations.
- 5 No extra pages will be given

Best of Luck

1. (a) Find the eigen value, eigen vector eigenspace of the matrix $A = \begin{pmatrix} 4 & 0 & 1 \\ -1 & -6 & -2 \\ 5 & 0 & 0 \end{pmatrix}$. Find also

the algebraic and geometric multiplicity of all the eigen values. (b) Let A be an idempotent matrix ($A^2=A$). Show that 0 and 1 are the only possible eigenvalues [CO-2][8+2=10].

2. (a) Find the **QR** factorization of the matrix $A = \begin{pmatrix} 2 & 8 & 2 \\ 1 & 7 & -1 \\ -2 & -2 & 1 \end{pmatrix}$. (b) Find out whether the

following matrix is orthogonal or not $\begin{pmatrix} 1/2 & -1/2 & 1/2 & 1/2 \\ 1/2 & 1/2 & 1/2 & -1/2 \\ -1/2 & 1/2 & 1/2 & 1/2 \\ 1/2 & 1/2 & -1/2 & 1/2 \end{pmatrix}$. [CO-2][8+2=10].

- 3.(a) Find the conjugate transpose of the matrix $A = \begin{pmatrix} 2-i & 8 & 2i \\ 1 & 7+i & -1-i \\ -2 & -2+i & i \end{pmatrix}$ (b) Let $u = \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$ and $v =$

$\begin{pmatrix} v_1 \\ v_2 \end{pmatrix}$ be two vectors in \mathbf{R}^2 . Is $\langle u, v \rangle = u_1 v_1 - 3u_2 v_2$ a inner product ? [CO-2][2+3=5]