



Mahindra University Hyderabad
École Centrale School of Engineering,
Minor-2 Examination Program: B.Tech
Branch: Computation & Mathematics Year: III Semester: I
Subject: Advanced Linear Algebra (MA3117)

Date: 25/10/2024
Time Duration: 1.5 Hours

Start Time: 02.00 PM
Max. Marks: 20

Instructions: All questions are compulsory.

Q 1:

5 marks

Find the orthogonal projection of a vector $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ onto null space of A , where $A = \begin{bmatrix} 1 & 3 & 4 \\ 2 & -1 & 1 \\ 3 & 2 & 5 \\ 5 & 15 & 20 \end{bmatrix}$.

Q 2:

5 marks

If P is a projector matrix then prove that $\text{range}(I - P) \cap \text{null}(I - P) = 0$, where I is an identity matrix of appropriate order.

Q 3 :

5 marks

Using Gram-Schmidt procedure, construct an orthonormal basis for column space of A , where

$$A = \begin{bmatrix} 2 & 1 & 2 \\ 6 & 2 & 4 \\ 1 & -1 & 0 \end{bmatrix}.$$

Q 4:

5 marks

Determine a Householder vector u for which the following matrix is a Householder reflector.

$$\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$$
