

Note : There are four questions. Answer each question with justification. Your answer script format should be either pdf or jpg (convenient to you) but in a single file. You can use one of the following medium to send me your answer script. **Institute Email, MS team chat box.**

Any submission after 3:55 PM will not be considered for evaluation. You have 15 minutes to write the answer and 5 minutes to submit the answer.

1. Let $A \in \mathbb{M}_5(\mathbb{C})$. The ij th entry of A is given by

$$a_{ij} = \begin{cases} 1 & \text{if } i + j = 6 \\ 0 & \text{othersise} \end{cases}$$

Find the the minimal polynomial of A . Hence check whether A is diagonalizable or not. [3]

2. Let $A \in \mathbb{M}_3(\mathbb{C})$ be Hermitian. Let 1, 1, 3 be the eigenvalues of A . Then write A^{-1} in the form $\alpha A + \beta B$ where $\alpha, \beta \in \mathbb{C}$. [2]
3. Let $A \in \mathbb{M}_2(\mathbb{R})$. Let $\text{trace}(A) = 1$ and $\det(A) = 1$. Then show that $A^{-1} = P(A)$ where P is a polynomial of degree 1. [3]
4. Let $A \in \mathbb{M}_2(\mathbb{C})$ and let $2 + i$ be an eigenvalue of A . Discuss about the diagonalizability of A . [2]