Week 03 IVLE Quiz

1. How many statements below is/are definitely true?

   (I) All invertible matrices are square matrices.

   (II) All square matrices are invertible.

   (III) All invertible matrices do not have a zero row.

   (IV) All square matrices without a zero row are invertible.

   (A) None.

   (B) Exactly one.

   (C) Exactly two.

   (D) More than two.

   Answer: (C)

2. Suppose $\boldsymbol{E_1}, \boldsymbol{E_2}, \boldsymbol{E_3}$ are elementary matrices such that $\boldsymbol{E_1 E_2 E_3 A} = \boldsymbol{B}$. Which of the statements below is/are correct?

   (I) $\boldsymbol{A}$ and $\boldsymbol{B}$ must be matrices of the same size.

   (II) $\boldsymbol{E_1}$ is the same size as $\boldsymbol{A}$.

   (III) $\boldsymbol{E_2}$ is the same size as $\boldsymbol{E_1}$.

   (IV) $\boldsymbol{Ax} = \boldsymbol{0}$ and $\boldsymbol{Bx} = \boldsymbol{0}$ have the same solution set.

   (A) None.

   (B) Exactly one.

   (C) Exactly two.

   (D) More than two.

   Answer: (D)

3. Suppose $\boldsymbol{A}$ and $\boldsymbol{B}$ are both lower triangular matrices of order n. If $(\boldsymbol{A}+\boldsymbol{B})$ is invertible, which of the statements below is/are correct?

(I) At least one of $\boldsymbol{A}$ and $\boldsymbol{B}$ must be invertible.

(II) $\boldsymbol{A}^T+\boldsymbol{B}^T$ is invertible.

(III) $(\boldsymbol{A}-\boldsymbol{B})$ is invertible.

(A) (I) only

(B) (II) only

(C) (III) only

(D) More than one of the statements are true.

Answer: (B)

4. How many matrices below **are not** elementary matrices?

(I) $\begin{pmatrix}1&0&0\\0&0&1\\0&0&1\end{pmatrix}$ (II) $\begin{pmatrix}0&1&0\\1&0&0\end{pmatrix}$ (III) $\begin{pmatrix}1&2&0\\0&0&1\\0&1&0\end{pmatrix}$.

(A) None.

(B) One.

(C) Two.

(D) All three.

Answer: (D)

5. $\boldsymbol{B}$ is a square matrix of order 3 such that if we perform one elementary row operation (represented by elementary matrix $\boldsymbol{E}$) on $\boldsymbol{B}$, we obtain $\boldsymbol{I_3}$, that is,

$$\boldsymbol{B} \underset{\boldsymbol{E}}{\longrightarrow} \boldsymbol{I_3}.$$

Which of the following statement is/are correct?

(I) $\boldsymbol{EB}=\boldsymbol{I_3}$

(II) $\boldsymbol{B}$ is an elementary matrix.

(III) $\boldsymbol{BX}=\boldsymbol{0}$ has only the trivial solution.

(A) (I) and (III) only

(B) (II) and (III) only

(C) (I) and (II) only

(D) All three statements are correct.

Answer: (D)