



Student's Name	Student's ID	Group No.

Question No.	I	II	III	IV	Total
Mark					

[I] Determine whether the following is **True** or **False**. [3 Points]

(1) The following system of equations is linear ( )

$$\begin{aligned}x - y + z &= 5 \\x + 2yz &= 0\end{aligned}$$

(2) The reduced row echelon form of the matrix  $\begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix}$  is  $I_2$ . ( )

(3) The matrix  $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & -3 \end{bmatrix}$  is elementary. ( )

(4) The matrix  $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 4 \\ 0 & 0 & -1 \end{bmatrix}$  is invertible. ( )

(5) If  $A$  and  $B$  are  $n \times n$  matrices, then  $(A + B)^2 = A^2 + 2AB + B^2$ . ( )

(6) If  $A$  is an invertible symmetric matrix, then  $A^{-1}$  is symmetric. ( )

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[II] Choose the correct answer. [6 Points]

(1) If  $A$ ,  $B$  and  $C$  are  $n \times n$  matrices, then  $AC - (C^T B)^T$  equals

- (a)  $(A - B)C^T$                       (b)  $(A - B^T)C$                       (c)  $(AC - BC)^T$                       (d) None of the previous
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(2) The values of  $a$ ,  $b$  and  $c$  for which  $\begin{bmatrix} 3 & a \\ 1 & a+b \end{bmatrix} = \begin{bmatrix} b & c-2 \\ c+2 & 0 \end{bmatrix}$  are

- (a)  $a = 1, b = 3, c = 3$                       (b)  $a = -3, b = 3, c = -1$                       (c)  $a = 0, b = 3, c = 2$                       (d) None of the previous
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(3) For  $A = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ ,  $A^{-2}$  equals

- (a)  $\begin{bmatrix} 11 & -8 \\ -4 & 3 \end{bmatrix}$                       (b)  $\begin{bmatrix} 3 & 8 \\ 4 & 11 \end{bmatrix}$                       (c)  $\begin{bmatrix} 1 & 4 \\ 1 & 9 \end{bmatrix}$                       (d) None of the previous
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(4) If  $B^3 = \begin{bmatrix} -8 & 0 & 0 \\ 0 & 27 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ , then  $tr(B)$  equals

- (a)  $\begin{bmatrix} -2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$                       (b) 20                      (c) 2                      (d) None of the previous
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(5) For  $\begin{bmatrix} 1 & 3 & 4 \\ 2 & 1 & 0 \\ 5 & 0 & -1 \end{bmatrix}$ , the minor  $M_{12}$  equals

- (a) 2                      (b) -2                      (c) -3                      (d) None of the previous
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(6)  $\begin{vmatrix} 1 & 4 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 2 & 3 & 1 & 5 \\ 1 & 2 & 3 & 5 \end{vmatrix}$  equals

- (a) 5                      (b) -10                      (c) 10                      (d) None of the previous

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**[III]** Let  $A = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ -1 & 1 & 0 \end{bmatrix}$ ,  $B = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 2 & 4 \\ 5 & 0 & 1 \end{bmatrix}$ . Find the following [6 Points]

(a)  $A + B$

(b)  $(3A)^{-1}$

(c) The matrix  $X$  for which  $AX = B$

OVER

**[IV]** [5 Points]

(a) **Solve** the following system

$$\begin{aligned}x + y + 3z &= 0 \\2x + y + 4z &= 1 \\3x + y + 5z &= 2\end{aligned}$$

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(b) **Is** the coefficient matrix of the previous system invertible? **Justify** your answer.

Good Luck