(B) T is invertible

(C) T is nilpotent*

(D) none of these

6. Consider $T : R^5 \to R^5$ be a linear transformation such that $T(x_1, x_2, x_3, x_4, x_5) = (x_1 - x_2, x_3 - x_4, 0, 0, 0)$. What is the dimension of the quotient vector space $\frac{R^5}{null\ T}$?

(A) 0

(B) 1

(C) 2*

(D) 3

7. Let A be a nilpotent matrix of order nxn with complex entries. What is the determinant of $B = A - I$, where I is the identity matrix of order nxn?

(A) 1

(B) -1

(C) 0

(D) $(-1)^n$*

8. Let $T : R^3 \to R^3$ be a linear operator defined by $TX = AX$, where $A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 4 & 7 \\ -2 & 2 & 0 \end{bmatrix}$ and $X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$. Then the range and kernel of T are given by

(A) a plane and line passing through the origin, respectively.*

(B) a line and plane passing through the origin, respectively.

(C) two lines passing through the origin.

(D) two planes passing through the origin.

9. A matrix $M_{n\times n}$, whose each element is 1. The correct statement(s) is/are
(i) The minimum polynomial of M is $x^2 - nx$.
(ii) 0 is the eigenvalue value of M with algebraic multiplicity of $n - 1$.
(ii) n is the eigenvalue value of M with algebraic multiplicity of $n - 1$.

(A) only (i)

(B) only (i) and (ii)*

(C) only (i) and (iii)

(D) All statements are correct.