

# 國立屏東大學 104 學年度學士班轉學考試

## 線性代數 試題

### (應用數學系)

\*注意事項：

- (1) 本試題共 1 頁。
- (2) 不必抄題，但請依序將題號標出，並寫在答案紙上，否則不予計分。

#### 一、證明及計算題 (共 100 分)

1. Let  $A$  be an  $m \times n$  matrix and  $B$  be an  $n \times m$  matrix with  $m > n$ . Please find the determinant of  $A \cdot B$ . (20%)
2. Let  $T: V \rightarrow W$  be a linear mapping. Please show that if  $\{v_1, \dots, v_n\}$  is linear dependent on  $V$ , then  $\{T(v_1), \dots, T(v_n)\}$  is linear dependent on  $W$ . (20%)
3. Please find the eigenvalues and the corresponding eigenvectors of the following matrix  $\begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$ . (20%)
4. Find the  $LU$ -factorization of  $\begin{bmatrix} -3 & 2 & -3 \\ 0 & 4 & 3 \\ 3 & 2 & 1 \end{bmatrix}$ . (10%)
5. If  $T_1(x, y) = (x - 2y, 2x + 3y)$  and  $T_2(x, y) = (2x, x - y)$ , find the standard matrix for  $T = T_1 \circ T_2$ . (10%)
6. If a linear transformation is defined by  $T(x) = Ax$ , find  $\ker(T)$  for  $A = \begin{bmatrix} 1 & -5 \\ 26 & 26 \\ -5 & 25 \\ 26 & 26 \end{bmatrix}$ . (10%)
7. Let  $T$  be a linear transformation such that  $T(1, 1, 1) = (2, 0, -1)$ ,  $T(0, -1, 2) = (-3, 2, -1)$  and  $T(1, 0, 1) = (1, 1, 0)$ . Find  $T(2, 1, 0)$ . (10%)