

國立虎尾科技大學九十七學年度第一學期期中考試題

班級:四電二甲乙 科目:工程數學(二) 時間:2008/11/6(星期四) 12:00-13:20

1. For which value(s) of  $k$  does this system  $\begin{cases} x_1 + x_2 - x_3 = -2 \\ 3x_1 - 5x_2 + 13x_3 = 18 \\ x_1 - 3x_2 + 5x_3 = k \end{cases}$  have

one or infinitely many solutions?

2. Find all vectors in  $R^3$  that are orthogonal to the three vectors  $[1 \ 1 \ 1]$ , and  $[1 \ 2 \ 3]$ .

3. Find all solutions  $x_1, x_2, x_3$  of the equation  $\vec{b} = x_1\vec{v}_1 + x_2\vec{v}_2 + x_3\vec{v}_3$ ,

$$\text{where } \vec{b} = \begin{bmatrix} -8 \\ -1 \\ 2 \\ 15 \end{bmatrix}, \vec{v}_1 = \begin{bmatrix} 1 \\ 4 \\ 7 \\ 5 \end{bmatrix}, \vec{v}_2 = \begin{bmatrix} 2 \\ 5 \\ 8 \\ 3 \end{bmatrix} \text{ and } \vec{v}_3 = \begin{bmatrix} 4 \\ 6 \\ 9 \\ 1 \end{bmatrix}.$$

4. Consider the system  $\begin{cases} x + y = C \\ 3y + z = C \\ x + 4z = C \end{cases}$  where  $C$  is a constant. Find the

smallest positive integer  $C$  such that  $x, y$  and  $z$  are all integers.

5. Find the rank of the matrix  $\begin{bmatrix} a & b & c \\ 0 & d & e \\ 0 & 0 & f \end{bmatrix}$  where  $a, d$  and  $f$  are

nonzero, and  $b, c$  and  $e$  are arbitrary numbers.

6. Is the vector  $[7 \ 8 \ 9]$  a linear combination of  $[1 \ 2 \ 3]$  and  $[4 \ 5 \ 6]$ ?

7. Determine a basis for the subspace  $S = \{(x_1, x_2, x_3) \mid x_1 + 2x_2 - 3x_3 = 0\}$  ..

8. Find an equation of the plane which contains  $A(1, 1, 1)$  and orthogonal to the line through  $B(2, 6, -3)$  and  $C(1, 0, -2)$ .

9. Solve  $a, b$  and  $c$ , if the rank of  $\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ a & b & c \end{pmatrix}$  is 2.

10. What is the dimension of the solution space of  $\begin{cases} x_1 + 2x_2 - x_3 + x_4 = 0 \\ x_2 - x_3 + x_4 = 0 \\ x_1 - x_2 + 2x_3 - 2x_4 = 0 \end{cases}$  .