# 國立彰化師範大學 97 學年度碩士班招生考試試題

系所：統計資訊研究所碩士班　　科目：基礎數學(微積分、線性代數)

☆☆請在答案紙上作答☆☆　　共 1 頁，第 1 頁

Part I. Linear Algebra (60%)

1. Find the Jordan form $J$ of the matrix $A$ below together with a non-singular matrix $P$ such that $P^{-1}AP = J$.

$$A=\begin{bmatrix} 3 & 0 & 1 \\ -4 & 1 & -2 \\ -4 & 0 & -1 \end{bmatrix}$$ (20%)

2. Find the matrix of the linear transformation $T(x_1, x_2, x_3) = (4x_1 + x_2 - x_3, x_1 + 3x_3, x_2 + 2x_3)^T$ with respect to the basis $(1, 1, 1)^T$, $(1, 0, 1)^T$, $(0, 1, 1)^T$. (20%)

3. Find an orthonormal basis for the plane $x-2y+3z = 0$ in $R^3$. (20%)

Part II. Calculus (40%)

4. Let $f$ be a function such that $f'$ is continuous on $[a, b]$. Show that

$$\int_a^b f(t) f'(t)dt = \frac{1}{2}[f^2(b) - f^2(a)].$$ (20%)

5. Find H'(2) given that

$$H(x) = \int_{2x}^{x^3-4} \frac{x}{1+\sqrt{t}}\, dt$$ (20%)