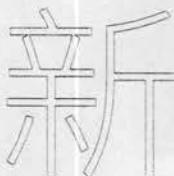科目：**工程數學一(線性代數)**

編號：353、362　　適用：電機系、電機系(通訊工程)

考生注意：
1.依次序作答，只要標明題號，不必抄題。
2.答案必須寫在答案卷上，否則不予計分。
3.限用藍、黑色筆作答；試題須隨卷繳回。

本試題
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(一) (24%, 每小題 4%)　　Let T: $R^2 \rightarrow R^2$ be a linear transformation

and that T(1, 0)=(2, 7), T(1, 1)=(4, 5)

(a) What is T(3, 5) ?

(b) What is T($a^2$, $b^2$) ?

(c) If T($p$,$q$)=(18, 54), Find $p$, $q$ ?

(d) Fund the null space of T ?

(e) Find the range of T ?

(f) Is T one-to-one ?

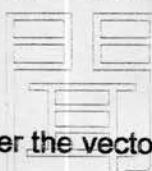(二) ( 18%, 每小題 6 %) Consider the following Linear system equation $\begin{cases} kx + y + z = 1 \\ x + ky + z = 1 \\ x + y + kz = 1 \end{cases}$

Determine $k$ condition to make system:

(a) A unique solution　　(b) No solution　　(c) Infinitely many solutions

(三)( 24%, 每小題 3 %) Consider the vector space of all functions of a variable $x$.

Determine the following sets of functions are linear independent or liner

dependent .(show details)

(a) $\sin x$, $\cos x$　　(b) $x$, $x^2$　　(c) $x$, $\sin x$　　(d) $\ln(x)$, $\ln(x^4)$
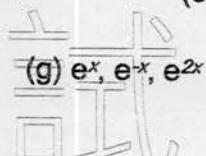
(e) 0, $\tan x$　　(f) $x$, $x^2$, $x^3$　　(g) $e^x$, $e^{-x}$, $e^{2x}$　　(h) $\sin^2 x$, $\cos^2 x$, $\cos 2x$

(四) ( 34%, (a)~(f)每小題 4 %; (g)~(h)每小題 5 % ) Let $A = \begin{bmatrix} a & b & c \\ p & q & r \\ x & y & z \end{bmatrix}$ and det($A$)=6,

Find:

(a) det (-$A$)　　(b) det (-2$A$)　　(c) det ($A^{-1}$)　　(d) det $(2A^{-1})^T$

(e) det ($adj(A)$)　　(f) det $\begin{bmatrix} a+2p & -x & 3p \\ b+2q & -y & 3q \\ c+2r & -z & 3r \end{bmatrix}$

(g) If $b = c = r = p = x = y = 0$, and $a > q > z > 0$, Find $a$, $q$, $z$.

(h) If $b = c = r = p = x = y = 0$, and $a > q > z > 0$, Find eigenvalues of $A$.