

國立臺北科技大學九十九學年度碩士班招生考試

系所組別：2140、2150 電機工程系碩士班丁、戊組

第二節 工程數學 試題

第一頁 共一頁

**注意事項：**

1. 本試題共六題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、(15%)

Let  $V$  denote the vector space consisting of all  $2 \times 2$  matrices. Consider the subset  $S$  consisting of matrices the sum of whose elements is zero. Is  $S$  a subspace?

二、(15%)

Consider the vector space  $\mathbf{R}^3$  consisting of all ordered triples of real numbers. Find the distance of the point  $\mathbf{x}=(1,3,-2)$  of  $\mathbf{R}^3$  from the subspace  $W$  consisting of all vectors of the form  $(a,a,b)$ .

三、(20%)

Compute  $e^A$  for  $A = \begin{pmatrix} -2 & -6 \\ 1 & 3 \end{pmatrix}$ .

四、(15%)

The random variable  $T$  has PDF

$$f_T(t) = \begin{cases} \frac{1}{3}e^{-\frac{t}{3}} & t \geq 0, \\ 0 & \text{otherwise.} \end{cases}$$

Given the event  $B = \{T > 2\}$ , find the conditional PDF  $f_{T|B}(t)$ .

五、(15%)

Random variables  $X$  and  $Y$  have joint PDF

$$f_{X,Y}(x,y) = \begin{cases} xy & 0 \leq x \leq 1; 0 \leq y \leq 2, \\ 0 & \text{otherwise.} \end{cases}$$

What is the probability of the event  $\{X^2 + Y^2 \leq 1\}$ ?

六、(20%)

Random variables  $X$  and  $Y$  have joint PDF

$$f_{X,Y}(x,y) = \begin{cases} 2 & 0 \leq y \leq x \leq 1, \\ 0 & \text{otherwise.} \end{cases}$$

Find the covariance of  $X$  and  $Y$ .