

國立臺北科技大學 105 學年度碩士班招生考試

系所組別：2131 電機工程系碩士班丙組

第二節 工程數學 試題 (選考)

第一頁 共一頁

注意事項：

1. 本試題共六題，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。

1. (15%) Find the general solution of the differential equation:

$$(2x^4 + x^2 y)dx + (x^4 y - x^3)dy = 0.$$

Hint: Assume that the integrating factor is a function of x .

2. (20%) Solve the following differential equation with zero initial conditions.

$$t^2 y''(t) - 2ty'(t) + 2y(t) = \cos(2 \ln(t)), t > 0$$

3. (15%) Solve the differential equation: $y''(t) + 2y'(t) + 2y(t) = \cos(t)\delta(t - \pi)$

with zero initial conditions.

4. (15%) Let $P_2(x)$ be the set of all polynomial of degree at most n . Show that

the polynomials $1+x$, $1-x$, and $-x-x^2$ are linearly independent in

$P_2(x)$.

5. (15%) Find all possible solutions of the linear system $Ax = b$,

where $A = \begin{bmatrix} 2 & 6 & 2 \\ 1 & 2 & -1 \\ 3 & 7 & -1 \end{bmatrix}$ and $b = \begin{bmatrix} -6 \\ 1 \\ -1 \end{bmatrix}$.

6. Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 2 \\ 0 & 0 & 2 \end{bmatrix}$.

(a) (5%) Calculate the eigenvalues of A .

(b) (15%) Find the matrix function e^A .