EE03

國立臺北科技大學108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

第一節　工程數學　試題（選考）

注意事項：

1. 本試題共六題，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
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. Solve the differential equation $(4xy^2-2)dy+y^3dx=0$. (15 分)

2. Solve the differential equation $y''+4y'+4y=e^{-2x}\ln(x)$. (20 分)

3. Solve the system of linear differential equations by using the Laplace transform. $\begin{bmatrix}\frac{dx_1(t)}{dt}\\ \frac{dx_2(t)}{dt}\end{bmatrix}=\begin{bmatrix}\sigma & \omega\\ -\omega & \sigma\end{bmatrix}\begin{bmatrix}x_1(t)\\ x_2(t)\end{bmatrix}$, $x_1(0)=A$, $x_2(0)=B$. (15 分)

4. Let V be the vector space of all 3×3 real matrices over $\Re$ and S be the set of skew-symmetric matrices.

   (a) Show that S is a subspace of V. (10 分)

   (b) Find a basis of S. (10 分)

5. Consider the matrix $A=\begin{bmatrix}2 & -4 & 4\\ 0 & 4 & -1\\ 0 & -1 & 4\end{bmatrix}$.

   (a) Compute the eigenvalues of A. (5 分)

   (b) Find the modal matrix P to diagonalize A. (10 分)

6. Find a basis and the dimension of the vector space spanned by all solutions of the following system of linear equations. (15 分)

$$\begin{aligned}4x_1-2x_2+3x_3&=0\\ 3x_1-4x_2+2x_3&=0\\ 6x_1+2x_2+5x_3&=0\end{aligned}.$$