

國立臺北科技大學九十六學年度碩士班招生考試

系所組別：1611、1612、1620、1630 電機工程系碩士班甲、乙、丙組

第二節 工程數學 試題

第一頁 共一頁

注意事項：

1. 本試題共七題，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。

1. (10%) The equation $P(x)y'' + Q(x)y' + R(x)y = 0$ is said to be *exact* if it can be written in the form $[P(x)y']' + [f(x)y]' = 0$. Using this concept to solve $y'' + xy' + y = 0$
2. (10%) Solve $y' = 1 + x^2 - 2xy + y^2$; known one solution is x .
3. (10%) Find the Laplace transform of $f(t) = (\sin 4t)/t$.
4. (20%) Find the general solutions of $(x^2+1)y'' - 2xy' + 2y = 6(x^2+1)^2$, known one solution of its homogeneous equation is x .
5. Let T be the linear operator on \mathbb{R}^3 defined by $T(x,y,z) = (2y+z, x-4y, 3x)$.
 - (a) (15%) Find the matrix of T in the basis $\{f_1=(1,1,1), f_2=(1,1,0), f_3=(1,0,0)\}$.
 - (b) (10%) Verify that $[T]_f[v]_f = [T(v)]_f$ for any vector $v \in \mathbb{R}^3$.
6. (10%) For the following matrix A , find a nonsingular matrix P such that $P^{-1}AP$ is diagonal.

$$A = \begin{bmatrix} 1 & -3 & 2 \\ -3 & 7 & -5 \\ 2 & -5 & 8 \end{bmatrix}$$

7. (15%) To find the $\det(A)$ that

$$A = \begin{bmatrix} a+x_1 & a & a & \cdots & a \\ a & a+x_2 & a & \cdots & a \\ a & a & a+x_3 & \cdots & a \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a & a & a & \cdots & a+x_n \end{bmatrix}$$