

國立臺北科技大學 104 學年度碩士班招生考試

系所組別：1301、1302、1303 車輛工程系碩士班

第二節 工程數學 試題

第一頁 共一頁

注意事項：

1. 本試題共 7 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%) Solve the initial value problem $y' = \frac{dy}{dx} = 3y$; $y(0) = 5.7$

- (1) find the general solution (5%)
- (2) find the particular solution (5%)

2. (10%) Solve the initial value problem $y'' + y' + 0.25y = 0$; $y(0) = 3$, $y'(0) = -3.5$

- (1) find the general solution (5%)
- (2) find the particular solution (5%)

3. (10%) Find the general solution for the fourth-order ODE

$$y^{(4)} - 5y'' + 4y = 0 \quad (\text{where } y^{(4)} = y^{(4)})$$

4. (20%)

(1) Find the inverse of $A = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$ (10%)

(2) Using the inverse of matrix A to solve the system $\begin{cases} 3x_1 + 4x_2 = 3 \\ 5x_1 + 6x_2 = 7 \end{cases}$ (10%)

5. (10%) Find the characteristic equation of $A = \begin{bmatrix} 5 & -2 & 6 & 1 \\ 0 & 3 & -8 & 0 \\ 0 & 0 & 5 & 4 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

6. (20%) Find the eigenvalues and eigenvectors of $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$

7. (20%) $A = \begin{bmatrix} 2 & 1 & 2 \\ 3 & 2 & 2 \\ 1 & 2 & 3 \end{bmatrix}$

(1) Compute the adjoint of matrix A (10%)

(2) Compute the inverse of matrix A (10%)