

中國文化大學 104 學年度碩士班考試入學招生考試試題

系所組：化學工程與材料工程學系奈米材料碩士班

節次：第 1 節

科目：工程數學

1. (50%) Solve $y(x)$ for the following differential equations.

(a) $y''+6y'+9y=0$ with $y(0)=2$ and $y'(0)=0$ (15%)

(b) $y''+y=0.001x^2$ with $y(0)=0$ and $y'(0)=1.5$ (20%)

(c) $(y^2-4)dx+xdy=0$ (15%)

2. (10%) Derive the Laplace transform for the function $\{\cos kt\}$ is

$$\mathcal{L}\{\cos kt\} = \frac{s}{s^2 + k^2}$$

3. (20%) matrix $M = \begin{pmatrix} -2 & 0 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$, Please find the three eigenvalues andeigenvectors of the matrix M .

4. (20%) Find the particular solution of following differential equation:

$$\begin{cases} \frac{dx}{dt} = 2x + y + 3e^{3t} \\ \frac{dy}{dt} = x + 2y \end{cases} \text{ which satisfies the initial condition } \begin{cases} x(0) = 5 \\ y(0) = 3 \end{cases}$$