國立臺灣師範大學 103 學年度碩士班招生考試試題

科目：工程數學　　適用系所：光電科技研究所

注意：1.本試題共 1 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則不予計分。

1. Please solve $2xy^2 + yy'' = (y')^2 \quad ; y(0) = 1,\ y'(0) = 2.$ **(10 points)**

2. Please solve $y'' + 3y' + 2y = \delta(x - 3)$ by Fourier transform. **(10 points)**

3. Find Fourier transform of $f(t) = t^2 e^{-5|t|}$. **(10 points)**

4. Find the area and volume if the vertices are (1,1,1), (2,1,1), (1,5,1), (1,1,3). **(10 points)**

5. Please find the general solution of $4xy'' + 2y' + 2y = 1.$ **(15 points)**

6. $f(x) = \begin{cases} 1 - x^2, & -1 < x < 1 \\ 0, & |x| > 1 \end{cases}$

   (1) Find Fourier transform of f(x). **(10 points)**

   (2) Find Fourier integral of f(x). **(5 points)**

7. $A = \begin{bmatrix} \cos w & \sin w \\ -\sin w & \cos w \end{bmatrix}$

   (1) Please find the eigenvalue and eigenvector of A. **(5 points)**

   (2) Please find the A^n. **(10 points)**

8. $f(z) = \dfrac{1}{1 + z^3}$

   (1) Please find the residues at the singular points of f(z) **(5 points)**

   (2) Find $\int_0^{\infty} \dfrac{1}{1 + x^3} dx$ **(10 points)**