

淡江大學八十七學年度碩士班入學考試試題

系別： 電機工程學系

科目： 工程數學

本試題共 壹 頁

1. Determine the inverse Fourier transform of the function (15%)

$$\frac{\sin(3\omega)}{\omega(2+i\omega)}$$

2. Solve the boundary value problem (20%)

$$\frac{\partial^2 y}{\partial t^2} = 16 \frac{\partial^2 y}{\partial x^2} \quad (0 < x < 5, t > 0)$$

$$y(0, t) = y(5, t) = 0, \quad (t > 0)$$

$$y(x, 0) = -3x^2(x-5), \quad (0 < x < 5)$$

$$\frac{\partial y}{\partial t}(x, 0) = 0, \quad (0 < x < 5)$$

3. Evaluate $\oint_{\Gamma} \frac{e^z}{(z+i)^3(z-i)} dz$ (15%)

where Γ is a closed path enclosing $-i$ and $-2i$.

4. Evaluate the integral $\int_0^{2\pi} \frac{1}{\cos^2\theta + 2\sin^2\theta} d\theta = ?$ (15%)

5. Use the Laplace transform to solve the initial value problem, (15%)

$$y'' + 2ty' - 4y = 1; \quad y(0) = y'(0) = 0$$

6. Find the general solution of (20%)

$$x^2 y'' - 4xy' + 4y = x^4 + x^2, \quad \text{for } x > 0$$