

淡江大學八十九學年度碩士班招生考試試題

系別：機械工程學系

科目：工程數學

本試題共 壹 頁

1. Find the general solution of

$$xy' = \frac{y^2}{x} + y. \quad (15\%)$$

2. Solve the nonhomogeneous equation

$$x^3 y''' - 3x^2 y'' + 6xy' - 6y = x^4 \ln x \text{ for } x > 0. \quad (15\%)$$

3. Solve the initial value problem

$$y'' + 2y' + 2y = \delta(t-3); y(0) = y'(0) = 0. \quad (15\%)$$

4. Compute both side of the conclusion of Stokes's theorem for $\vec{F} = y \vec{i} + z \vec{j} + x \vec{k}$ and the surface $z = 1 - (x^2 + y^2), z \geq 0$. (20%)

5. Expand $f(x) = x, 0 < x < 2$ in a half range (a) sine series, (b) cosine series. (15%)

6. Solve the boundary value problem

$$\begin{aligned} \frac{\partial u}{\partial t} &= 2 \frac{\partial^2 u}{\partial x^2} \quad (0 < x < 3), \\ u(0, t) &= 10, u(3, t) = 40, (t > 0), \\ u(x, 0) &= 25 \quad (0 < x < 3). \end{aligned} \quad (20\%)$$