

# 淡江大學九十二學年度碩士班招生考試試題

系別：化學工程與材料工程學系      科目：工程數學

准帶項目請打「○」否則打「x」
簡單型計算機
X

本試題共 / 頁

**\*\* No credits if the method used is not assigned. \*\***

15% 1. Solve

$$3y' + y = (1-2x)y^4$$

20% 2. Solve

$$x^2y'' + 3xy' + y = \frac{4}{x}$$

15% 3. Find the first three nonzero terms of the power series solution of the following initial value problem, about the point where the initial conditions are given.

$$y'' - xy = 2x \quad y(1) = 3, \quad y'(1) = 0$$

25% 4. Solve the boundary value problem

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

$$u(x, 0) = f(x)$$

$$u(0, t) = 10$$

$$u(2, t) = 20$$

25% 5. Use the Laplace transform in  $t$  to solve the boundary value problem

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} \quad (x > 0, \quad t > 0)$$

$$u(x, 0) = 100$$

$$u(0, t) = \begin{cases} 20 & 0 < t < 1 \\ 0 & t \geq 1 \end{cases}$$

$$u(\infty, t) = 100$$

The Laplace transform of complementary error function is

$$\mathcal{L}\left\{\operatorname{erfc}\left(\frac{a}{2\sqrt{t}}\right)\right\} = \frac{e^{-a\sqrt{s}}}{s}$$