

國立臺北科技大學 100 學年度碩士班招生考試

系所組別：1410、1420、1431、1432

能源與冷凍空調工程系碩士班甲、乙、丙組

第一節 工程數學 試題

第一頁 共一頁

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

(1) Please solve the following ordinary differential equations:

(a)(10%) $(x+2)^2 y'' - (x+2)y' + y = 3x+4$

(b)(10%) $x^3 y''' - 3x^2 y'' + 6xy' - 6y = 0$, $y(1) = 2$, $y'(1) = 1$, $y''(1) = -4$

(c)(10%) $x^2(x+1)y'' - x(2+4x+x^2)y' + (2+4x+x^2)y = -x^4 - 2x^3$. (**Hint:** $y = x$ is a homogeneous solution.)

(2)(10%) Solve the initial value problem $\frac{d^2 y}{dt^2} + 2t \frac{dy}{dt} - 4y = 1$, $y(0) = 0$, $\frac{dy(0)}{dt} = 0$.

(3)(20%) Solve the mechanical system: ($H(t)$ is the unit step function)

$$x_1'' = -\frac{13}{2}x_1 + \frac{5}{2}x_2 + 2[1 - H(t-3)]$$

$$x_2'' = \frac{5}{2}x_1 - \frac{13}{2}x_2$$

$$x_1(0) = x_2(0) = 0, x_1'(0) = x_2'(0) = 0$$

(4)(20%) Find the steady-state temperature for a thin disk of radius R if the temperature on the boundary is $f(\theta) = \cos^2(\theta)$ for $-\pi \leq \theta \leq \pi$.

(5)(20%) Solve the Poisson's equation with the boundary conditions shown below.

$$\nabla^2 u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f(x, y)$$

