

國立臺北科技大學

九十二學年度機電科技研究所博士班入學考試

工程數學（自動化組）試題

填准考證號碼

第一頁 共一頁

--	--	--	--	--	--	--	--

注意事項：

1. 本試題共【3】題，配分共100分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. Solve the following differential equations (let $y' = dy/dx$, $y'' = d^2y/dx^2$)

(a) $y' = (6xy - y^2) / (3xy - 6x^2)$ (15%)

(b) $y' = y^2/x + y/x - 2/x$ (15%)

(c) $y'' + 6y' + 9y = 8e^{-3x} / (x^2 + 1)$ (15%)

(d) $4x^2y'' + 4xy' - y = 12/x$ (15%)

2. Solve the differential equation by using Laplace transform method (20%)

$$y'' + 2y' + 2y = \delta(t - 3)$$

$$y(0) = y'(0) = 0$$

where δ is the Dirac Delta function and is defined as

$$\begin{aligned} \delta(t) &= 1/\epsilon \text{ if } 0 \leq t < \epsilon \\ &= 0 \text{ if } t < 0 \text{ or } t \geq \epsilon \end{aligned}$$

3. Determine the Fourier series of the periodic function f defined by

(20 %)

$$f(t) = t^2 \quad \text{for } 0 < t < 3$$

$$f(t + 3) = f(t) \quad \text{for all } t$$