

逢甲大學101學年度碩士班招生考試試題 編號：063 科目代碼：

科目	控制數學（含常微分方程、拉氏轉換、線性代數、傅立葉轉換、複變函數）	適用系所	自動控制工程學系	時間	100 分鐘
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※請務必在答案卷作答區內作答。

1. Let $f(x)$ be a periodic function of period 2π and is defined as

$$f(x) = \begin{cases} 0, & \text{if } -\pi < x < 0 \\ x, & \text{if } 0 < x < \pi \end{cases}, \text{ and } f(x+2\pi) = f(x).$$

Find the Fourier series expansion of $f(x)$. (15%)

2. Evaluate the complex integration:

$$\int_C \operatorname{Re}(z) dz, \quad C: z(t) = 3t + it^2, 0 \leq t \leq 1. \quad (10\%)$$

3. Solve the ordinary differential equations:

(a) $y'' + 3y' + 6y = \sin(2x)$. (15%)

(b). $y''' - 6y'' + 9y' = 0$. (10%)

4. Solve the following differential equation by Laplace transform methods

$$y'' + 2y' + 3y = tu_s(t-1) \quad y(0) = 1, y'(0) = -2$$

, where $u_s(t)$ is the unit step function. (20%)

5. Solve the equation

$$(3x^2 - y^2)dy - 2xydx = 0. \quad (15\%)$$

6. Solve the differential equation by the Frobenius' method (15%)

$$y'' + \frac{1}{4x}y' + \frac{1}{8x^2}y = 0.$$