

逢甲大學100學年度碩士班招生考試試題 編號：068 科目代碼：330

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. Use the Laplace transform to solve the following integral equation. (15 %)

$$y(t) = (t-1)e^t - 3e^t \int_0^t e^{-\tau} y(\tau) d\tau$$

2. Find a general solution of the following equation. (15 %)

$$y'' + 2y' + 2y = \frac{e^{-x}}{\cos^3 x}$$

3. Solve the following initial value problem by the method of undetermined coefficients. (20 %)

$$y'' + 4y' + 4y = 4 \cos x + 3 \sin x, \quad y(0) = 1, \quad y'(0) = 0$$

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

$$f(x) = \begin{cases} 0, & \text{if } -\pi < x < 0 \\ 1, & \text{if } 0 < x < \pi \end{cases}, \text{ and } f(x+2\pi) = f(x)$$

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

5. Evaluate the integral $\int_{-\infty}^{\infty} \frac{1}{(x^2+2)^2} dx$. (20 %)

6. The transformation $T: R^2 \rightarrow R^2$ is defined by

$$T(x_1, x_2) = (x_1 + x_2, x_1 - x_2).$$

Is T a linear transformation or not? Clarify your statement. (15 %)