

國立中央大學 106 學年度碩士班考試入學試題

所別： 企業管理學系 碩士班 一般甲組(一般生)

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科目： 工程數學

本科考試禁用計算器

*請在答案卷 內作答

須有計算過程

1. Solve the following homogeneous differential equation with the specified auxiliary conditions: (20%)

$$\frac{d^3 y(t)}{dt^3} - 3 \frac{dy(t)}{dt} + 2y(t) = 0, \quad y(0) = 0, \quad y'(0) = -1, \quad y''(0) = -4$$

2. Find the Fourier transform of the following signal:

$$x(t) = \sin(2\pi t)e^{-t}u(t). \quad (20\%)$$

3. Evaluate $\int_{-\infty}^{\infty} \frac{1}{(1+jt)^2} dt$. (20%)

4. Determine the differential equation description for the system with the following frequency response: (20%)

$$H(j\omega) = \frac{2 + 3j\omega - 3(j\omega)^2}{1 + 2j\omega}$$

5. Suppose that

$$x(t) = \begin{cases} 1, & 0 \leq t \leq 1 \\ 0, & \text{elsewhere} \end{cases}$$

and $h(t) = x(t/\alpha)$, where $0 < \alpha \leq 1$.

- (a) Determine and sketch $y(t) = x(t) * h(t)$. (10%)

- (b) If $dy(t)/dt$ contains only three discontinuities, what is the value of α ? (10%)

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