淡江大學 102 學年度碩士班招生考試試題

系別： 電機工程學系
積體電路與計算機系統組

科目：工程數學 (僅含線性代數、機率學、常微分方程、複變函數)

考試日期：3月10日(星期日) 第2節

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1. (25%) Solve the following differential equation

$$y''(x) + 3y'(x) + 2y(x) = 4e^{2x} + 3\cos(x)$$

2. (25%) Find eigenvalues and eigenvectors of the following matrix.

$$A = \begin{bmatrix} 2 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 3 \end{bmatrix}$$

3. (25%) Find $f'(z_o)$ of the following equation as $z_o = 1 + i$

$$f(z) = 3z^2 + 2$$

4. (25%) Find the expected value of output of the following system as a input with Power Spectrum Density (PSD) function defined as $S_{in}(f) = 4kTR$ is applied into

(p.s. $\int \frac{dx}{x^2+1} = \tan^{-1}x$)

$$S_{in}(f) \longrightarrow \boxed{|H(f)|^2 = \frac{1}{(2\pi RCf)^2 + 1}} \longrightarrow S_{out}(f)$$