

國立中央大學 106 學年度碩士班考試入學試題

所別： 電機工程學系 碩士班 電波組(一般生)

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科目： 工程數學(不含複變)

本科考試禁用計算器

\*請在答案卷          內作答

須有計算過程

參考用

1. (20%) Find the quadratic polynomial  $p(x)$  that gives the best squares fit to the following data  $(x, y)$ :  $(0, 3), (1, 2), (2, 4), (3, 4)$ .
2. (20%) Let  $L: R^2 \rightarrow R^3$  be the linear transformation defined by  $L(\mathbf{x}) = [x_2, (x_1 + x_2), (x_1 - x_2)]^T$   
Find the matrix representation  $A$  of  $L$  with respect to the ordered bases  $\{\mathbf{u}_1, \mathbf{u}_2\}$  and  $\{\mathbf{b}_1, \mathbf{b}_2, \mathbf{b}_3\}$ , where  $\mathbf{u}_1 = [1, 2]^T$ ,  $\mathbf{u}_2 = [3, 1]^T$ ,  
and  $\mathbf{b}_1 = [1, 0, 0]^T$ ,  $\mathbf{b}_2 = [2, 1, 0]^T$ ,  $\mathbf{b}_3 = [1, 2, 1]^T$ .
3. (20%) Find the Laplace transform of the following function:

$$f(t) = k \sin\left(\frac{t}{2}\right) \quad (0 < t < 2\pi)$$

4. (20%) Solve the following differential equation:

$$y' - 1 = e^{-y} \sin x$$

5. (20%) For a continuous-time non-periodic signal  $x(t)$ , the signals is

$$x(t) = t \cdot e^{j\omega_0 t} \cdot e^{-at} u(t).$$

Please find its Fourier transform  $X(j\omega)$ .