

# 大同大學 100 學年度轉學入學考試試題

考試科目：工程數學

所別：電機工程學系

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註：本次考試 不可以參考自己的書籍及筆記；不可以使用字典；不可以使用計算器。

1. (20%) Solve the following system by Gauss-Jordan elimination.

$$w + 2x - y = 4$$

$$x - y = 3$$

$$w + 3x - 2y = 7$$

$$2u + 4v + w + 7x = 7$$

2. For the following matrix  $A$

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

Find

(a) (5%) the characteristic equation

(b) (5%) the eigenvalues

(c) (10%) the eigenvectors corresponding to each of the eigenvalues.

3. (20%) Solve the general solution for the following differential equation

$$\frac{d^2 y}{dx^2} + \lambda^2 y = 0,$$

where  $\lambda > 0$ ,  $y(-L) = y(L)$ ,  $\frac{dy}{dx}(-L) = \frac{dy}{dx}(L)$

4. (20%) Solve the general solution for the following differential equation

$$\frac{d^2 y}{dx^2} - 6 \frac{dy}{dx} + 9y = 5e^{3x}$$

5. (20%) Find Fourier series expansion for the following function:

$$f(t) = \begin{cases} 1 & 0 < t < 1 \\ 0 & 1 < t < 2 \end{cases}$$