

國立勤益科技大學 102 學年度研究所碩士班招生筆試試題卷

所別：電機工程系

組別：電能科技組

科目：工程數學

准考證號碼：□□□□□□□□ (考生自填)

考生注意事項：

- 一、考試時間 80 分鐘。
- 二、請將各題解答書寫至答案卷中。
- 三、

試題一：〈20 分〉

Find the Fourier series representation of the function

$$f(x) = \begin{cases} 0 & -\pi < x < 0 \\ \pi & 0 < x < \pi \end{cases}; f(x+2\pi) = f(x)$$

試題二：〈20 分〉

Find the Laplace transform solution of the following system.

$$\begin{cases} 2x' - 3y + 2y' = 0 \\ x' + y' = t \end{cases}, x(0) = 0, y(0) = 0$$

試題三：〈20 分〉

$$A = \begin{bmatrix} -2 & 1 & 1 \\ 0 & 1 & 1 \\ -3 & 0 & 6 \end{bmatrix}, \text{ compute } A^{-1}.$$

試題四：〈20 分〉

Differential equation  $xy' - 3y = 2x^3$ ,

(a) Show that the differential equation is not exact (6%), (b) find an integrating factor (7%), (c) find the general solution (7%).

試題五：〈20 分〉

Let  $\varphi(x, y, z) = x^2y + xz$ ,  $P_0 = (1, 2, -1)$  and  $\vec{A} = 2\vec{i} - 2\vec{j} + \vec{k}$ . Find the directional derivation of  $\varphi(x, y, z)$  at  $P_0$  in the direction of  $\vec{A}$ .