

國立高雄大學 107 學年度研究所碩士班招生考試試題

科目：工程數學

系所：電機工程學系

是否使用計算機：是

考試時間：100 分鐘

本科原始成績：100 分

1.(20%) Discuss and determine whether the set is linearly independent or linearly dependent.

(a) Set $S_1 = \left\{ \begin{bmatrix} 1 \\ 0 \\ -1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 0 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ -1 \\ 2 \end{bmatrix} \right\}$ (b) Set $S_2 = \{2 + x, 2 + 5x - x^2, x + x^2\}$

2.(20%) Solve $X' = \begin{pmatrix} 2 & -2 \\ 8 & -6 \end{pmatrix} X + \begin{pmatrix} 1 \\ 3 \end{pmatrix} t^{-1} e^{-2t}$

3.(15%) Solve $\frac{dy}{dx} = (x + y + 1)^2$

4.(15%) Solve $y'' + 3y' + 2y = \frac{1}{1 + e^x}$

5.(15%) $4xy'' + \frac{1}{2}y' + y = 0$ Find the series solutions about $x=0$. Write down the first three nonzero coefficients of each linearly independent series solutions.

6.(15%) $f(x) = \begin{cases} 1 & , -5 < x < 0 \\ 1 + x & , 0 \leq x < 5 \end{cases}$, find the Fourier series on the interval $(-5, 5)$