編號： 186、198、206 國立成功大學107學年度碩士班招生考試試題

系　所：電機工程學系、電腦與通信工程研究所、電機資訊學院-微電、奈米聯招

考試科目：工程數學　　考試日期：0205，節次：3

第 / 頁，共 / 頁

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. 10% (a) Find the eigenvalues of

$$C = \begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \quad \text{and} \quad C^2 = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

10% (b) Find the determinants of C + I and C + 2I

Where $I = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

2. 10% (a) Find the Fourier sine series expansion in $[0, \pi]$ of the function h(x) defined in $[0, \pi]$ by $h(x) = -1$ in $[0, \pi/2]$ and $h(x) = 1$ in $[\pi/2, \pi]$. Sketch the function represented by the sine series in the symmetric interval $[-\pi, \pi]$.

10% (b) Find the Fourier cosine series expansion in $[0, \pi]$ of the function h(x) defined in part (a). Sketch the function represented by the cosine series in the symmetric interval $[-\pi, \pi]$.

3. 10% Determine the constant A so that the following function is analytic everywhere.

$$f(z) = \begin{cases} A\frac{\cosh z - 1}{z^2} & if\ z \neq 0 \\ 1 & if\ z = 0 \end{cases}$$

4. 10% 解下列微分方程式:

$$(2xy+3y)dx+(4y^3+x^2+3x+4)dy=0\ ,\ y(0)=1$$

5. 16% 解方程式:

$$y''+9y = x^2\sin 3x$$

6. 24% 矩陣 $A = \begin{bmatrix} 5 & -4 & 2 \\ 3 & -2 & 2 \\ 2 & -2 & 3 \end{bmatrix}$ 求矩陣 A 的特徵值 (5%)、特徵向量 (9%)

及 e^{At} (10%)