編號： 177 、>00　　國立成功大學 108 學年度碩士班招生考試試題

系　　所：電機工程學系、電機資訊學院-微電、奈米聯招

考試科目：工程數學　　考試日期：0223，節次：3

※ 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. 20%　Let　matrix

$$A = \begin{bmatrix} 0 & -1 \\ 4 & 0 \end{bmatrix}$$

Find its eigenvalues and eigenvectors and write the vector

$$u(0) = \begin{bmatrix} 2 \\ 0 \end{bmatrix}$$ as a combination of those eigenvectors.

(a) Solve the equation du/dt = Au starting with the same vector u(0) at time t = 0.

2. 10%　Let　$f(z) = \frac{1}{(2-z)(z+3)}$

Write the Laurent series expansion of f(z) for $5 < |z-2| < \infty$ as a power series of $(z-2)$

3. 20%　(a) Let a and b in equation (1) are given constants, what wil the equation be transformed to if z = In x is substituted in it.

$$x^2y'' + axy' + by = 0 \qquad (x > 0) \qquad (1)$$

(b) Use the result of part (a) to find the general solution of

$$x^2y'' - 3xy' + 3y = 0$$

4. 15%　Solve the following differential equation:

$$(x - 4x^2y^3)dy + (4x^4 - y)dx = 0$$

5. 15%　Solve the following differential equation, using Laplace transformation method. y(t) is a function of t and u(t) is the unit step function.

$$y'' + 2y = u\left(t - \frac{\pi}{\sqrt{2}}\right) - u(t - \sqrt{2}\,\pi), \quad y(0)=1, \quad y'(0)=0$$

6. 20% Find the general solution of the following equation:

$$y' = \frac{y-x}{y+x}$$