國立成功大學

110學年度碩士班招生考試試題

編　號：160

系　所：生物醫學工程學系

科　目：工程數學

日　期：0202

節　次：第 1 節

備　註：不可使用計算機

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※ 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. (25 points)The function described as following;

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

Answer the following questions

(a) (5 points) Plot the function f(t)

(b) (10 points) Find the Laplace transformation of f(t)

(c) (10 points) Find the Fourier transformation of f(t)

$$F(s)=\int_0^\infty f(t)e^{-st}dt\ ,\ F(\omega)=\int_{-\infty}^{\infty}f(t)e^{-i\omega t}dt$$

2. (15 points) The differential equation $\ddot{y}(t)+4\dot{y}(t)+8y(t)=0$

$y(0)=1\ \ \dot{y}(0)=0$

(a) (10 points) Find the y(t).

(b) (5 points) Plot the function of y(t) roughly.

3. (10 points) The eigenvalues of a matrix A are λ_1, λ_2 , and their associate eigenvectors x_1 and x_2, if $\lambda_1\neq\lambda_2$, then verify x_1 and x_2 are linearly independent.

4. (10 points) Find the inverse Laplace transform of $\frac{1}{(s^2+\beta^2)^2}$

5. (10 points) Find the Laplace Transform of following functions

$\cos\varpi t$ and $\sin\varpi t$

6. (20 points) Two vectors $\vec{A}=(1\ \ 2\ \ 3)$, $\vec{B}=(4\ \ 5\ \ 6)$

(a) To find $\vec{A}\bullet\vec{B}$ (inner product)。(5 points)

(b) To find $\vec{A}$ x $\vec{B}$ (vector product or cross product)。(5 points)

(c) How to verify $\vec{A}$ and $\vec{B}$ are linearly independent or linearly dependent ? (10 points)

7. (10 points) $x_1=[1,2,1,2]$, $x_2=[3,4,3,4]$

To find the linear convolution and circular convolution between x_1 and x_2 .