

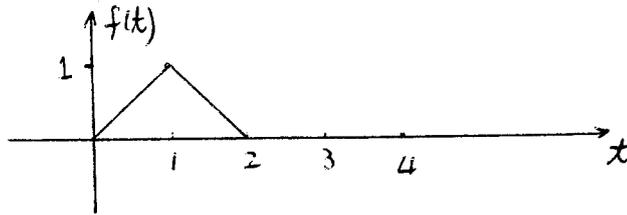
系所組別： 生物醫學工程學系甲、乙、丁組

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

1. (35%) For a signal
- $f(t)$
- described as following



- Find the Laplace Transformation of $f(t)$ (10 points)
- Find the Fourier Transformation of $f(t)$ (10 points)
- If the signal $f(t)$ passes through the following elements which described by e^{-s} , $\frac{1}{s}$ and s , respectively, please plot the output signals roughly. (15 points)

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

2. (15%) Find the solution of following differential equation

$$\ddot{y}(t) + 4y(t) = \sin 2t, \quad \dot{y}(0) = 0, y(0) = 0$$

3. (20%) The first order differential equation is described as

$$\dot{y}(t) + p(x)y(t) = r(t)$$

- Please derive the response to initial condition (homogeneous solution) (10 points)
- Please derive the response to the input $r(t)$ (particular solution) (10 points)

4. (30%) Answer the following questions! (5 points each)

- The definition of eigenvector and eigenvalue of a matrix A .
- Write down the procedure to obtain eigenvectors and eigenvalues.
- Definition of inner product of two vectors \vec{A} and \vec{B}
- Definition of linearly independent between \vec{A} and \vec{B}
- What are simple curve and simple connected region (domain)?
- How to define linear transformation and take an example!