

Series 6

Exercise 1

Solve the following differential equation:

$$\ddot{x}(t) + 2\dot{x}(t) + x(t) = -e^{-t}\sin(t) \quad x(0) = 0, \dot{x}(0) = 2$$

Exercise 2

Calculate $x(t)$ corresponding to the following Laplace transforms:

$$\text{a) } X(s) = \frac{s(s+1)}{(s+2)(s+3)(s+4)}$$

$$\text{b) } X(s) = \frac{(s+4)}{(s+1)^2}$$

$$\text{c) } X(s) = \frac{1}{s^2+s+1}$$

Exercise 3

The impulse response of a dynamic system is given by:

$$g(t) = 2\varepsilon(t)e^{-2t}$$

- a) Determine the transfer function of the system.
- b) Evaluate its step response.
- c) Evaluate its response to the input

$$u(t) = \varepsilon(t-1)e^{-(t-1)}$$