Cairo University
Faculty of Engineering
Computer Dept.

ELC 3252
Control Engineering
3rd year - 2022

Sheet 1
Laplace Transform

1. Solve the following homogeneous differential equation using:

$$\ddot{y}(t) + 3\dot{y}(t) + 2y(t) = 0$$

a) Laplace transform
b) Conventional Techniques

2. Solve the following differential equations:

a) $\ddot{y}(t)+3\dot{y}(t)+2y(t)=u(t)=unit\ step$, assume the initial conditions:
$y(0)=-1, \dot{y}(0)=2$

b) $\ddot{y}(t)+3\dot{y}(t)+2y(t)=\dot{x}(t)+3x(t)$, assume the initial conditions:
$y(0)=1$, $\dot{y}(0)=0$ and the input is given by: $x(t)=e^{-4t}$.

3. Test the linearity of the systems described by the following i/p – o/p relations:

a) $y(t)=au(t)$, where 'a' is a constant.
b) $y(t)=u^3(t)$
c) $y(t)=e^{u(t)}$
e) $\ddot{y}(t)+a\dot{y}(t)+y(t)=u(t)$, $y(0)=\dot{y}(0)=0$

4. Find the Transfer Function of the following systems: initial conditions = 0

a) $\ddot{y}(t)+3\dot{y}(t)+2y(t)=\dot{x}(t)+3x(t)$

b) $\dot{y}(t)+y(t)=x(t-T)$