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