AAE 364 Control Systems Analysis

Problem Set 3

Professor Inseok Hwang
School of Aeronautics and Astronautics, Purdue University
Fall 2019

Issued 9/6; Due 9/13

Reading Assignment:

Class material for the Laplace Transform; Sections 1,2, 3 and 7 in Chapter 2.

Problems

1. Find the inverse Laplace transforms of the following function:
$$F(s) = \frac{4s+1}{(s+1)(s+2)^2}$$
2. Find the inverse Laplace transforms of the following function:
$$F(s) = \frac{5}{s(s^2+\omega^2)}$$
3. Obtain the inverse Laplace transform of the following function:
$$F(s) = \frac{2e^{-s}}{s+1}$$
4. Solve the differential equation
$$\ddot{x} + 3\dot{x} + 6x = e^{-t}, \;\; x(0) = 0, \;\; \dot{x}(0) = 0$$
5. Solve the differential equation
$$\dot{x} + 2x = \delta(t), \;\; x(0-) = 0$$
6. Solve the following differential equation:
$$\ddot{x} + 2\dot{x} + 5x = 0, \;\; x(0) = 0, \;\; \dot{x}(0) = 3$$
7. Solve the following differential equation:
$$\ddot{x} + 2\zeta\omega_n\dot{x} + {\omega_n}^2 x = 0, \;\; x(0) = a, \;\; \dot{x}(0) = b$$
where a and b are constants.