Carleton University

Dept. of Systems and Computer Engineering

Systems and Simulations—SYSC 3600 Fall 2014

Homework #2

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1. What it is the inverse Laplace transform of the following functions?
   (a) $F(s) = \frac{s^3+3s^2+s+1}{s(s+1)(s+2)(s+3)}$.
   (b) $F(s) = \frac{s^3+3s^2+s+1}{(s+1)(s+2)(s+3)}$.
   (c) $F(s) = \frac{s^3+3s^2+s+1}{(s+1)^2(s+3)}$.
   (d) $F(s) = \frac{3s^2+s+1}{s^2+5s+4}$.
   (e) $F(s) = \frac{s^2+2s+12}{s(s^2+4s+5)}$.
   (f) $F(s) = \frac{1}{s(s+1)^2(s^2+4s+5)}$.
2. Use the time-shifting property to obtain the inverse transform of
$$F(s) = \frac{1}{s^2}(1 - e^{-2s}) - \frac{1}{s}e^{-2s}.$$
3. Find the solution of the following differential equations:
   (a) $\ddot{x} + \dot{x} + x = \cos 2t$, $x(0) = 0$, $\dot{x}(0) = 0$.
   (b) $\ddot{x} + 4x = t$, $x(0) = 0$, $\dot{x}(0) = 0$.
   (c) $\ddot{x} + 4x = t$, $x(0) = 0$, $\dot{x}(2) = 1$.