Laplace Tutorial 9th and 10th October 2019

Q1 Find the Laplace transform of $f(t) = \cosh(at)$.

Q2. A linear system is described by the following differential equation:

$$\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 2\frac{du}{dt} + 1$$

Find the system poles and zeros and plot them in the s-plane. Is the system stable?

Q3. Calculate the Laplace transform of $f(t) = \sinh(at)$.

Q4. Calculate the inverse Laplace transform for $Y(s) = \frac{10}{s(s^2+5s+4)}$

Q5. A system has a pair of complex conjugate poles, $p_1, p_2 = -1 \pm j2$, a single real zero, $z_1 = -4$, and a gain factor $K = 3$. Find the differential equation representing the system. Plot the poles and zeros and comment on stability.

Q6. A linear system is described by the following differential equation:

$$\frac{d^2y}{dt^2} + 7\frac{dy}{dt} + 12y = 3\frac{du}{dt} + 2$$

Determine the system poles and zeros and plot them in the s-plane. Is the system stable?

Q7. Calculate the inverse Laplace transform for $Y(s) = \frac{s+7}{(s^2+6s+13)}$