Questions

What is partial fraction expansion?
What is the cover-up rule?
What is the impedance of a capacitor, including initial conditions?
What is the impedance of an inductor, including initial conditions?
How do we analyze voltage dividers in the s-domain?
How do we analyze current dividers in the s-domain?
How do we implement source transformations in the s-domain?
How do we apply s-domain analysis to circuits?

1) $$F(s) = \frac{s+1}{(s+4)\cdot(s+3)\cdot(s+2)}$$

a. Find the poles and zeros
b. Draw the pole zero diagram

Pole zero diagram

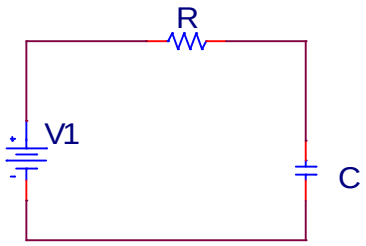
2) Transfer functions
Find the poles and zeros for the following functions
Apply partial fraction expansion to the following functions to find f(t)

a. $$F(s) = \frac{2 \cdot s}{s^2 + 8s + 25}$$

b. $$F(s) = \frac{2s}{(s+3)^2}$$

c. $$F(s) = \frac{4s^2 + 12s + 8}{(s+8)(s+4)^2(s+1)}$$

S-domain analysis



a. Draw the s-domain equivalent circuit. V1 is an arbitrary source.
b. Symbolically, determine the transfer function for the voltage across the capacitor.
c. If the initial conditions are zero and V1 is a step function 5u(t), R = 1kΩ and C = 2E-6F, find the voltage across the capacitor.
d. If the source voltage is 10V for t < 0 and 5V for t >0, R = 1kΩ and C = 2E-6F, find the voltage across the capacitor.

LAPLACE TRANSFORMS

Signal	f(t)	F(s)
Impulse	$\delta(t)$	1
Step	$u(t)$	$\frac{1}{s}$
Constant	$Au(t)$	$\frac{A}{s}$
Ramp	$tu(t)$	$\frac{1}{s^2}$

LAPLACE TRANSFORMS

Signal	f(t)	F(s)
Exponential	$e^{-\alpha t}u(t)$	$\frac{1}{s+\alpha}$
Damped Ramp	$[te^{-\alpha t}]u(t)$	$\frac{1}{(s+\alpha)^2}$
Cosine Wave	$[\cos\beta t]u(t)$	$\frac{s}{s^2+\beta^2}$
Damped Cosine	$[e^{-\alpha t}\cos\beta t]u(t)$	$\frac{s+\alpha}{(s+\alpha)^2+\beta^2}$

LAPLACE TRANSFORMS

Time Domain	s-Domain
$Af_1(t)+Bf_2(t)$	$AF_1(s)+BF_2(s)$
$\int_0^t f(\tau)\,d\tau$	$\frac{F(s)}{s}$
$\frac{df(t)}{dt}$	$sF(s)-f(0^-)$
$e^{-\alpha t}f(t)$	$F(s+\alpha)$
$t\,f(t)$	$-dF(s)/ds$
$f(t-a)u(t-a)$	$e^{-as}F(s)$