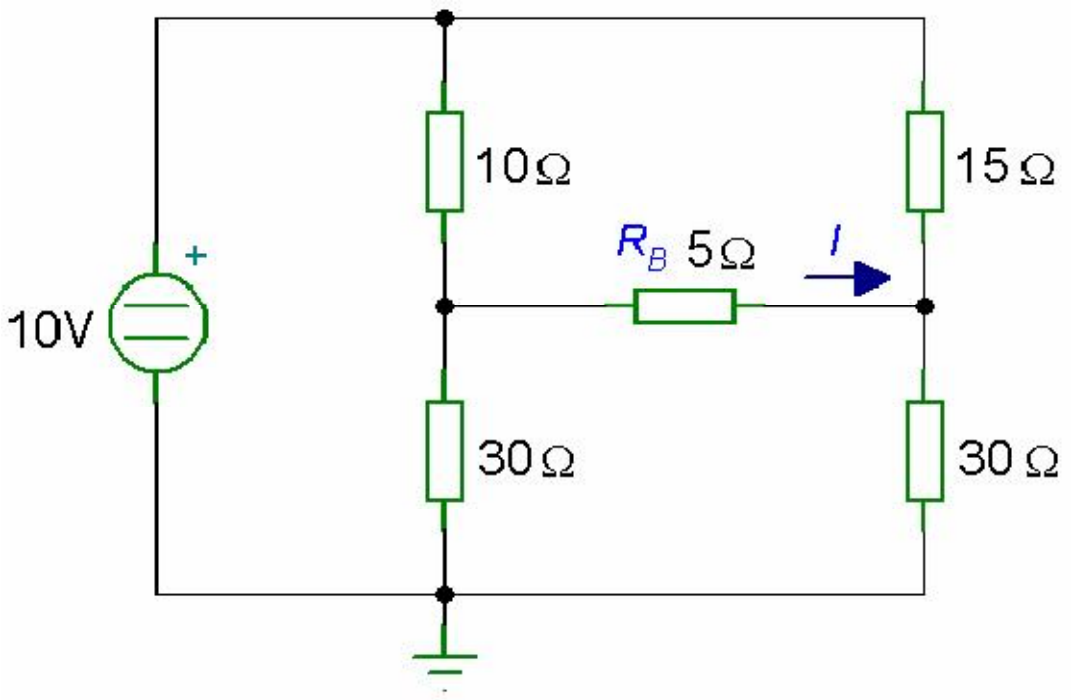
Loop Analysis

Example

For the circuit shown below find the current flowing through the resistor R_B. In addition find the power supplied by the voltage source.



Bridge Circuit

Results from MATLAB

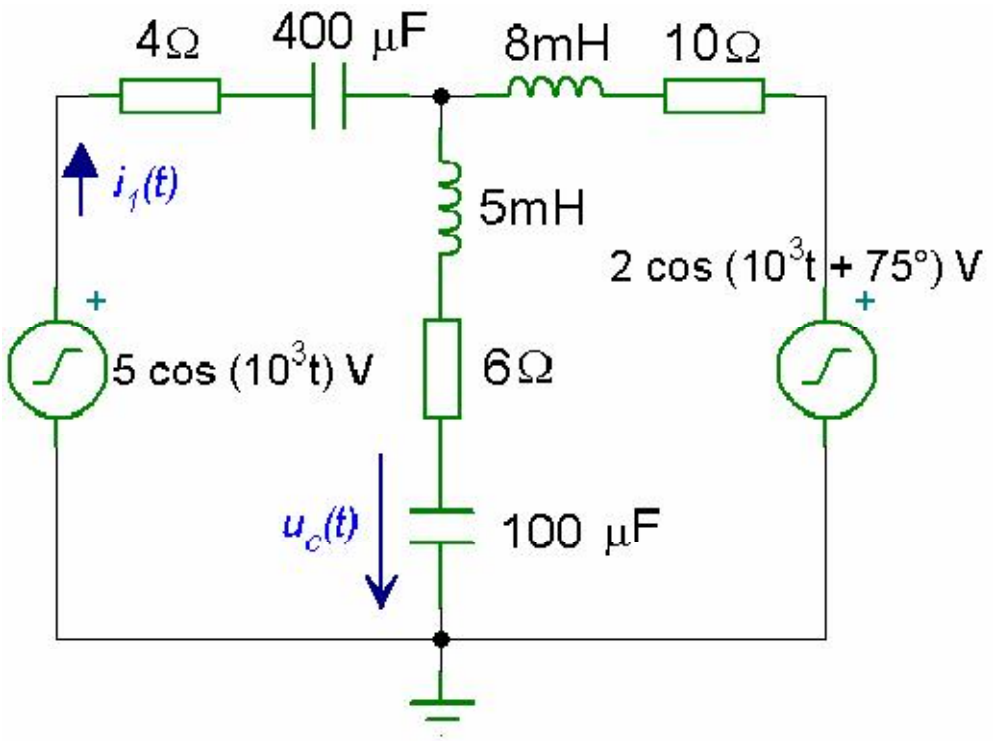
The current through the resistor RB is 0.037037 A.
The power supplied by voltage source is 4.7531 W.

Solve the same example in SwitcherCAD.

Loop Analysis (AC Analysis)

Example

For the circuit shown below find the current $i1(t)$ and the voltage $uC(t)$.



Circuit with Two Sources

Results from MATLAB

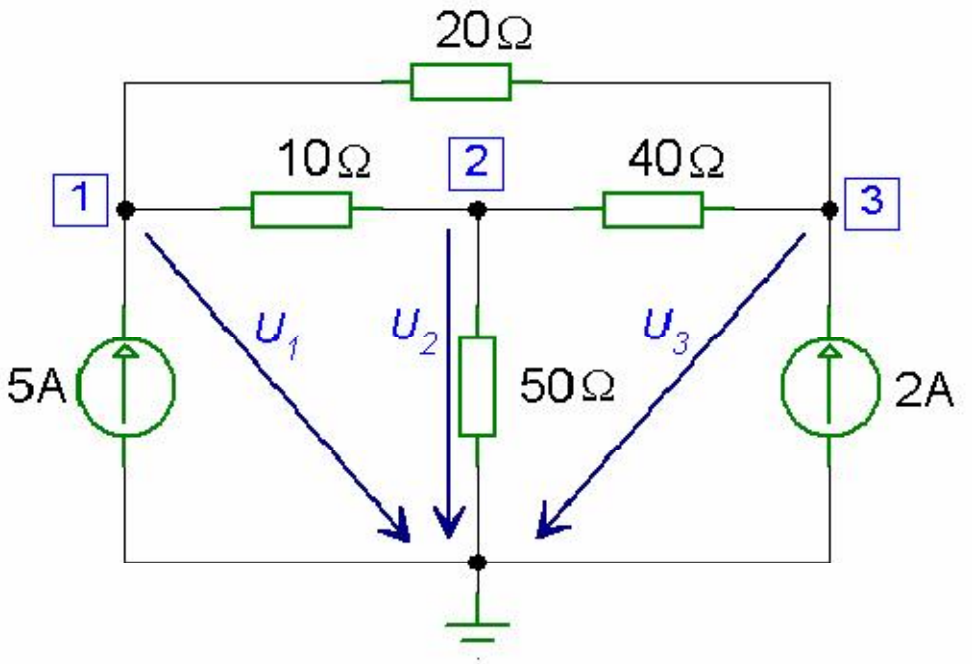
From the MATLAB results, the time domain current $i_1(t)$ is
$i_1(t) = 0.388 \cos (10^3 t + 15.02°)$ A
and the time domain voltage $u_C(t)$ is
$u_C(t) = 4.218 \cos (10^3 t - 40.86°)$ V

Solve the same example in SwitcherCAD.

Nodal Analysis

Example

For the circuit shown below find the nodal voltages U_1, U_2 and U_3.



Circuit with Nodal Voltages

Results from MATLAB

The nodal voltages U1, U2 and U3 are

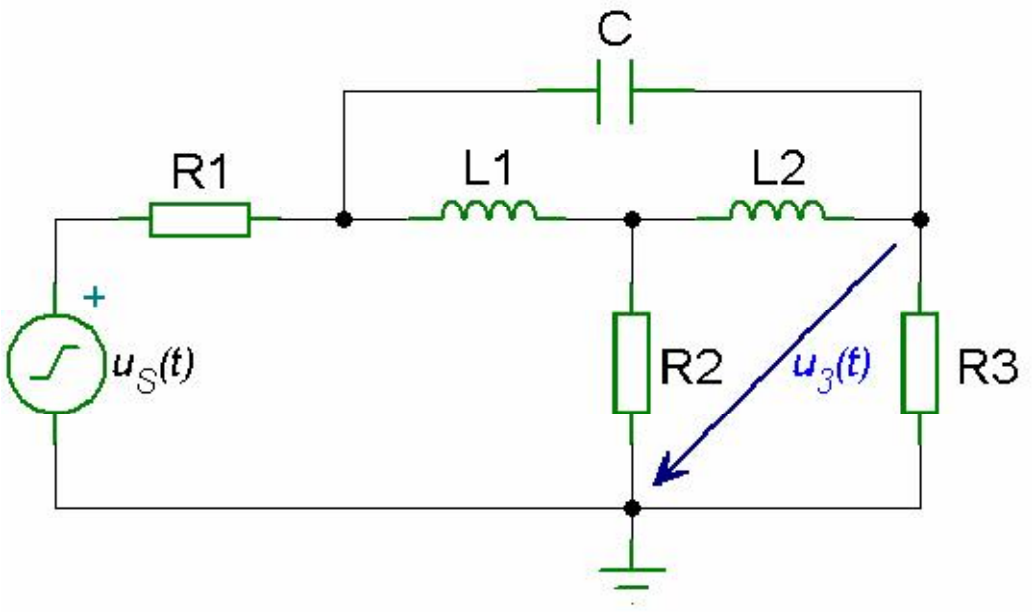
```
U =
    404.2857
    350.0000
    412.8571
```

Solve the same example in SwitcherCAD.

Nodal Analysis (AC Analysis)

Example

For the circuit shown below find the voltage $u_3(t)$ when R_1 = 20 Ω, R_2 = 100 Ω, R_3 = 50 Ω, L_1 = 4 H, L_2 = 8 H, C = 250 μF, $u_S(t)$ = 8 cos (ω t + 15°) V and ω = 10 rad/s.



RLC Circuit with Sinusoidal Excitation

Results from MATLAB

voltage U_3:

magnitude = 1.8504 V

angle = -72.4533°

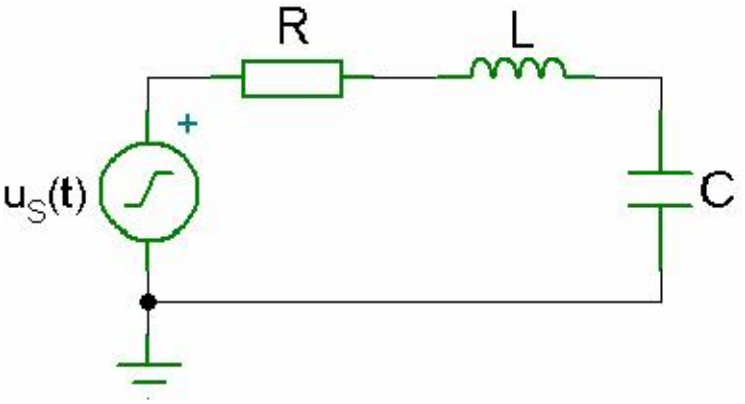
From the MATLAB results, the time domain voltage $u_3(t)$ is $u_3(t)$ = 1.85 cos (ω t – 72.45°) V

Solve the same example in SwitcherCAD.

Resonance

Example

For the circuit shown below with using MATLAB plot the frequency dependency of the current magnitude and find the resonance frequency ω_r when R = 5 Ω, L = 20 mH, C = 400 µF and $u_S(t)$ = 100 sin (ω t) V.



RLC Circuit

Results from MATLAB

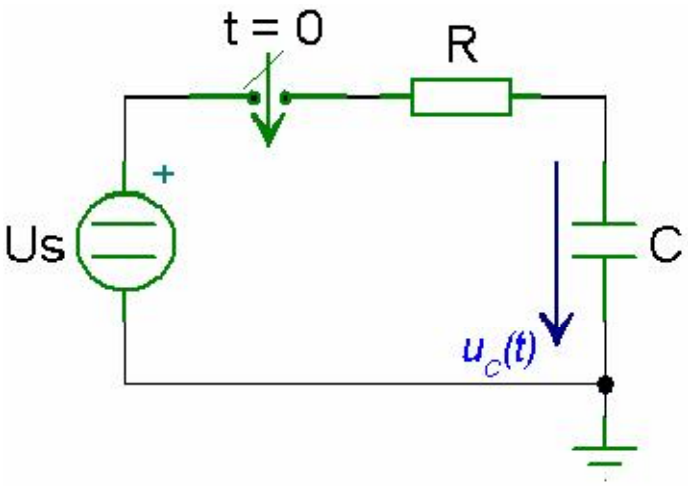
The resonance frequency is
wr =
353.5534

Solve the same example in SwitcherCAD.

Transient Analysis

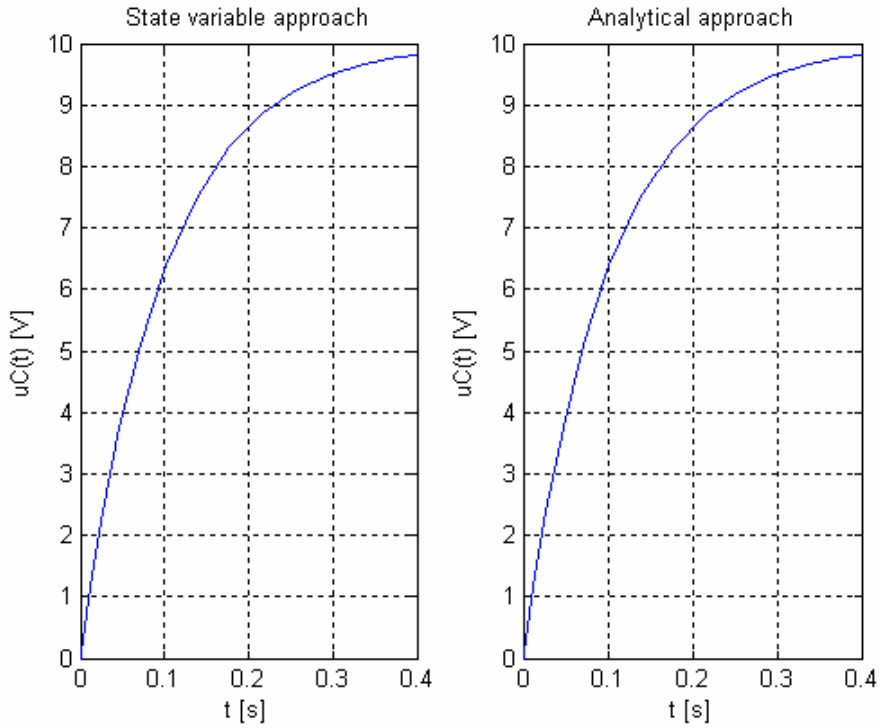
Example

For the circuit shown below find the voltage $u_C(t)$ between the interval 0 to 0.4 s, assuming that $u_C(0)$ = 0 V. Use a numerical solution to the differential equations and analytical solution, when R = 10 kΩ, C = 10 µF and U_S = 10 V.



Circuit

Results from MATLAB

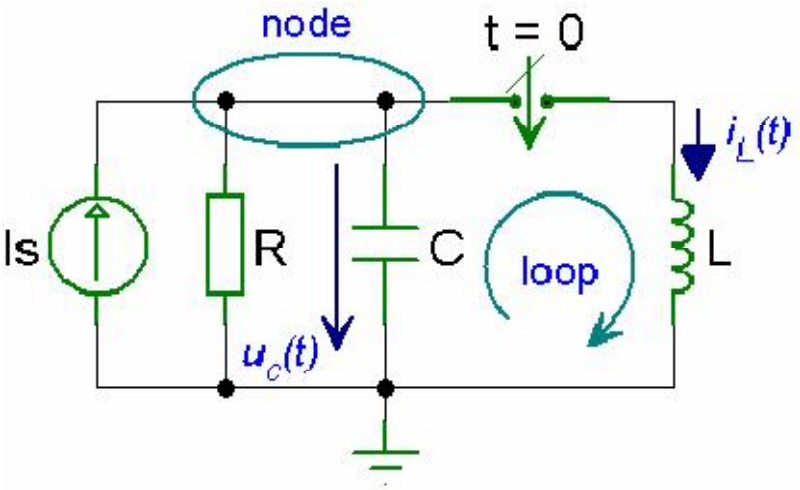


Solve the same example in SwitcherCAD.

Transient Analysis

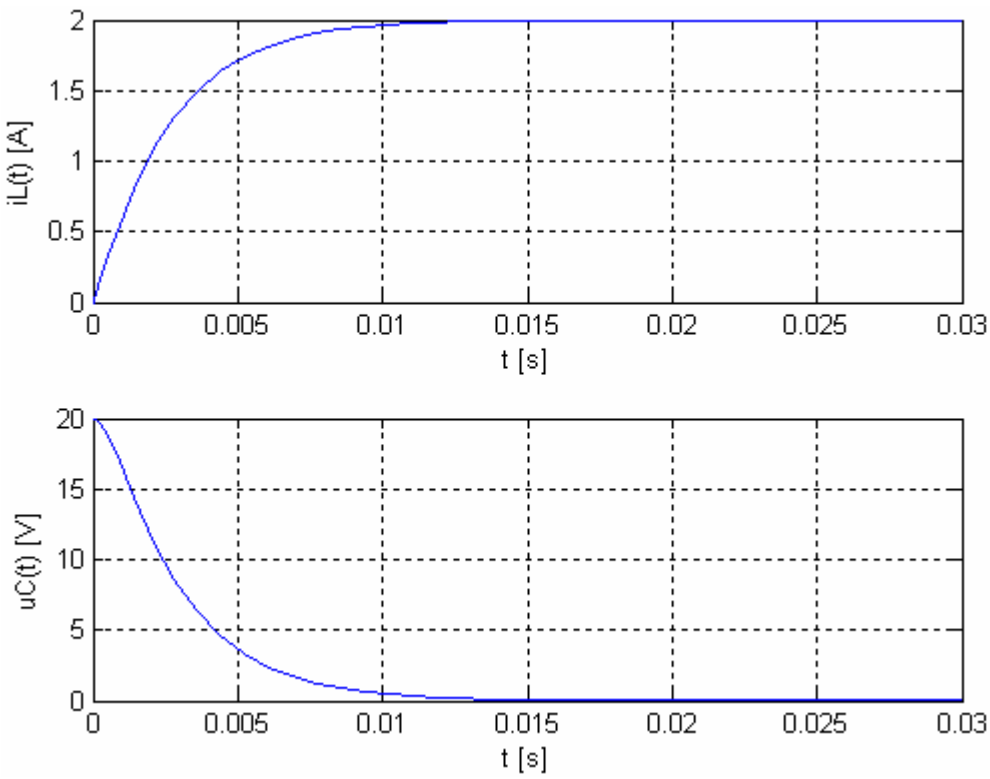
Example

For the circuit shown below find the current $i_L(t)$ and the voltage $u_C(t)$. Use a numerical solution to the differential equations, when R = 10 Ω, L = 31.25 mH, C = 50 μF and I_S = 2 A. The switch has been opened for a long time.



Circuit

Results from MATLAB

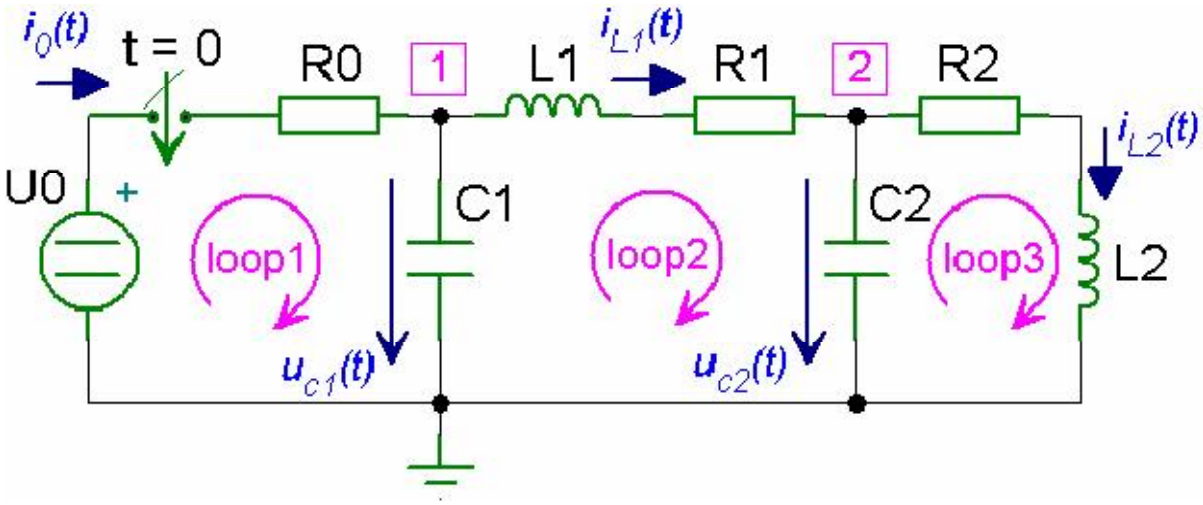


Solve the same example in SwitcherCAD.

Transient Analysis

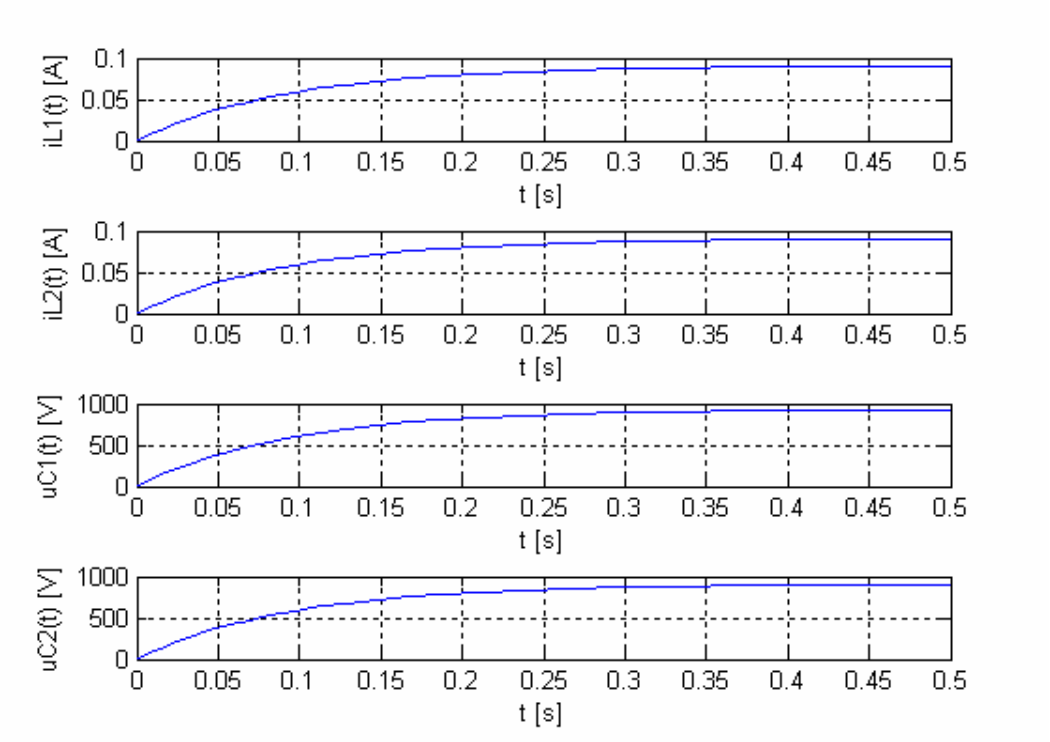
Example

For the circuit shown below find the currents $i_{L1}(t)$, $i_{L2}(t)$ and the voltages $u_{C1}(t)$, $u_{C2}(t)$. Use a numerical solution to the differential equations, when R_0 = 100 kΩ, R_1 = 300 Ω, R_2 = 10 kΩ, L_1 = 0.01 mH, L_2 = 10 mH, C_1 = 10 μF, C_2 = 10 nF, and U_0 = 10 kV. The switch has been opened for a long time.



Circuit

Results from MATLAB



Solve the same example in SwitcherCAD.

Fourier Analysis

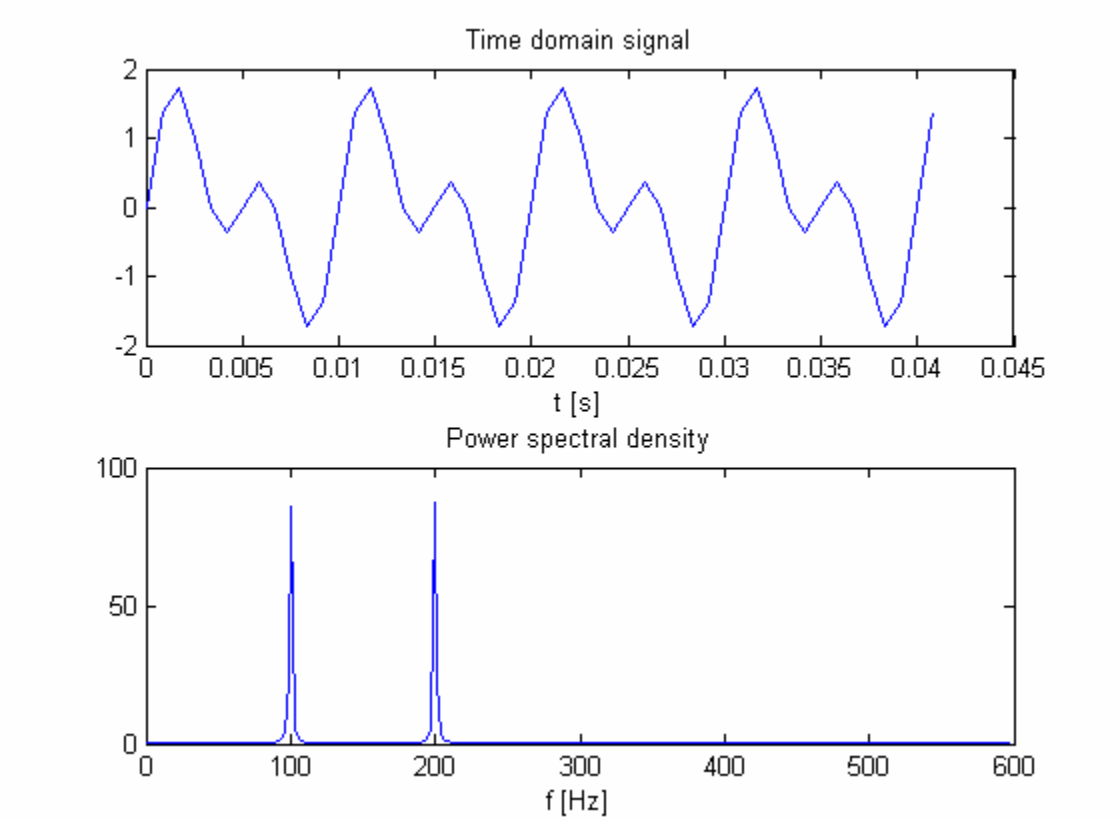
Example

Given a signal

$$g(t) = \sin(200\pi t) + \sin(400\pi t)$$

Generate and plot 512 points of $g(t)$. Assume a sampling rate of 1200 Hz. Find the power spectrum of $g(t)$.

Results from MATLAB



Solve the same example in SwitcherCAD.