

**Question 1** (3 pts)

Given a circuit as in the figure 1.

Write the system of equations for the given circuit by the nodal voltage method? Express branch currents in terms of chosen node voltage?

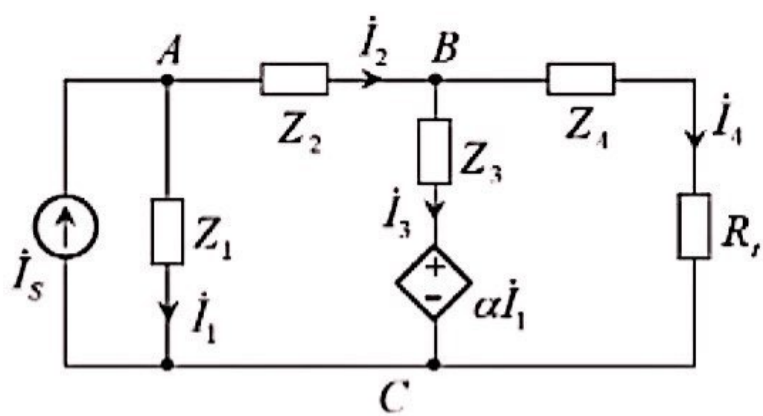


Figure 1

**Question 2** (3 pts)

Given a circuit as in the figure 2, where:  $R_1 = 20\Omega$ ,  $R_2 = 80\Omega$ ,  $L_2 = 0.5H$ ,  $R_3 = 40\Omega$ ,  $V_s = 60V$  (DC).

Using the Laplace transformation, find the step response  $i_L(t)$  when the switch  $S$  is opened at the time  $t = 0$ ? (Note that, for  $t < 0$ , the given circuit was being in steady state)

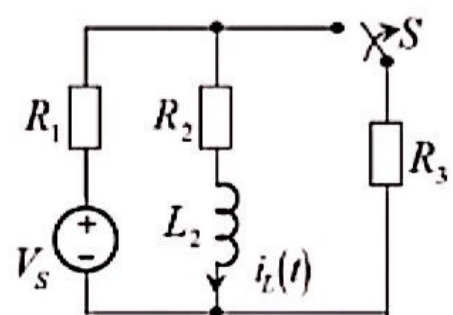


Figure 2

**Question 3** (3 pts)

Given a circuit as in the figure 3, where:

$\dot{E}_3 = 20\angle 0^\circ V$ ;  $\dot{E}_7 = 10\angle 30^\circ V$  (all in RMS);

$Z_3 = 10 + j5\Omega$ ;  $Z_4 = 20\Omega$ ;  $Z_5 = 15 + j10\Omega$ ;

$Z_6 = 10\Omega$ ;  $Z_7 = 5 + j5\Omega$ ; two-port network with

the admittance parameters  $Y = \begin{bmatrix} 0,05 & -0,04 \\ 0,04 & -0,05 \end{bmatrix} S$ .

Calculate the currents through  $Z_3$  and  $Z_7$  (using the nodal voltage method)?

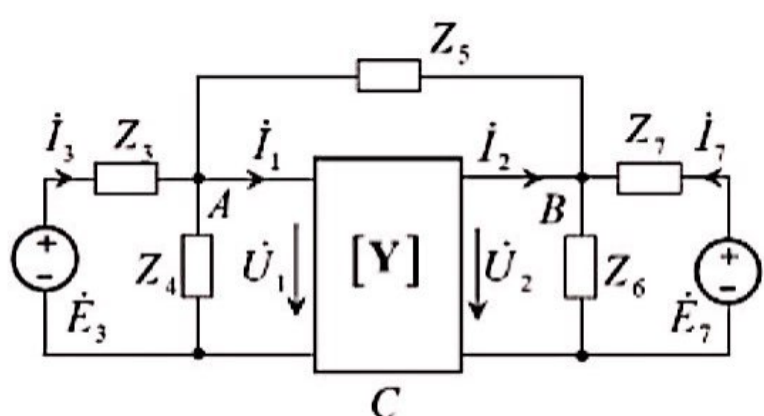


Figure 3