

Question 1: (3 pts)

Given a circuit in Fig. 1 in which $R_1 = R_2 = 40\Omega$, $L_1 = 2H$, $C_2 = 4mF$,

$$e_1 = e_2 = 314\sin(314t) \text{ V},$$

the impedance parameters and the transmission parameters:

$$\mathbf{A} = \begin{bmatrix} 2 & j30 \\ j0.1 & -2 \end{bmatrix}; \quad \mathbf{Z} = \begin{bmatrix} 30 & 20 \\ 20 & 50 \end{bmatrix}.$$

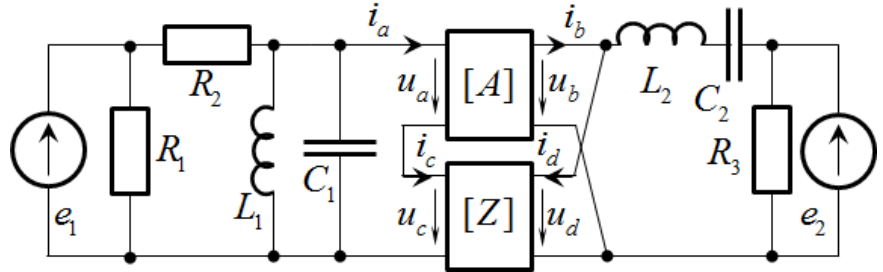


Figure 1

Propose a parametric set of C_1 , L_2 and R_3 such that the output power of the two voltage sources are identical? Compute that power.

Question 2: (3 pts)

Consider the circuit in Fig. 2, $e_1 = 50V(DC)$; $e_2 = 100\sqrt{2}\sin(100t) + 200\sqrt{2}\sin(200t + 30^\circ)V$;

$e_4 = 60V(DC)$; $e_5 = 80\sqrt{2}\sin(200t)V$; $R_1 = 20\Omega$; $R_2 = 40\Omega$; $R_3 = 30\Omega$; $R_4 = 50\Omega$; $R_5 = 20\Omega$;

$R_6 = 10\Omega$; $L_1 = 0,1H$;

$L_3 = 0,2H$; $L_4 = L_6 = 0,05H$;

$C_2 = 2 \cdot 10^{-4}F$; $C_5 = 5 \cdot 10^{-4}F$.

a) Obtain the time-varying expressions of currents $i_1(t)$ and $i_6(t)$.

b) Calculate the effective power of those two branches?

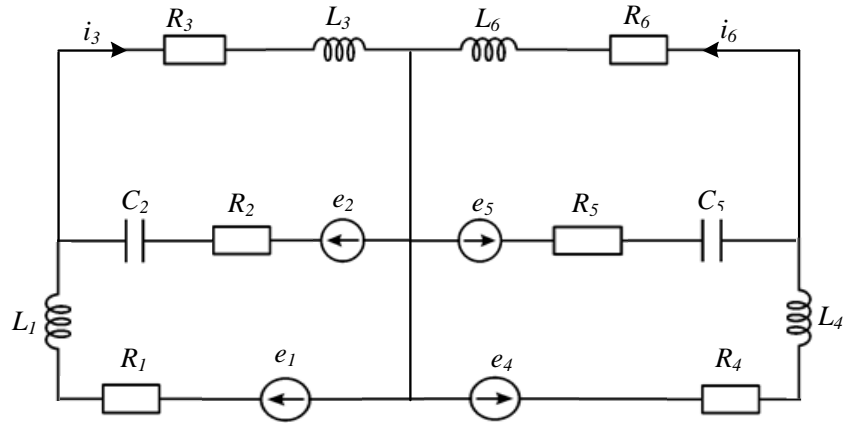


Figure 2

Question 3: (3 pts)

For a circuit in Fig. 3. Given

$Z_0 = 5 + j10\Omega$; $Z_1 = 5 + j5\Omega$;

$Z_2 = 15 + j9\Omega$; $Z_3 = -j30\Omega$;

$Z_4 = -j9\Omega$; $Z_{M1} = j7\Omega$;

$\dot{E}_0 = 10\angle 0^\circ V$; $\dot{E}_1 = 5\angle 30^\circ V$; the

operational amplifier is ideal.

Infer the voltage $\dot{\phi}_O$

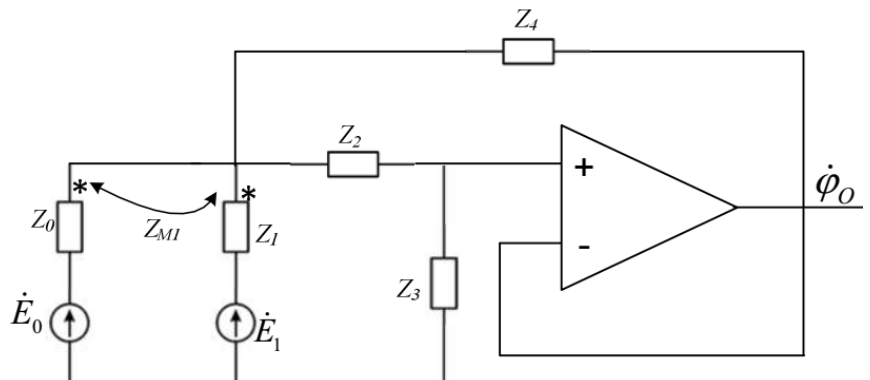


Figure 3

