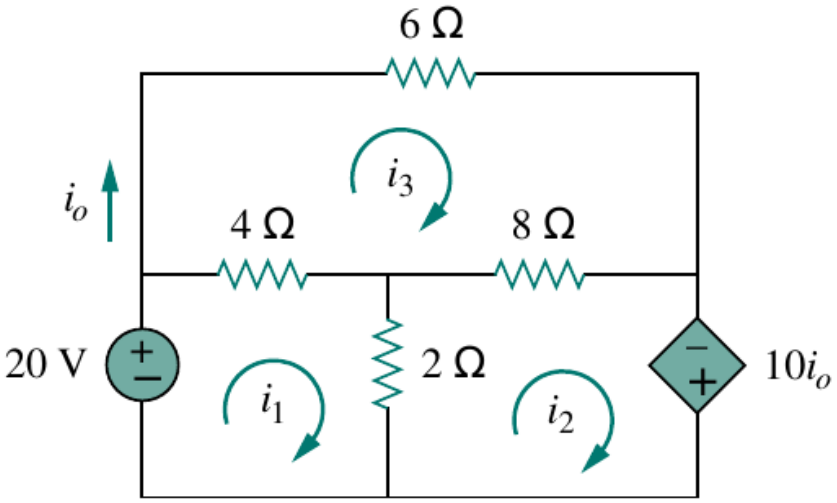
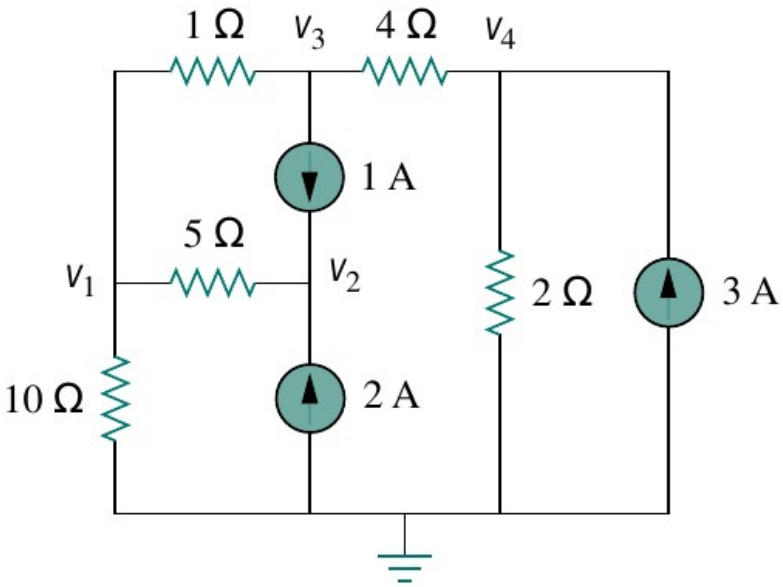
1 - Using mesh analysis, find i_0 in the given circuit (write all mesh equations to obtain full point)



$$6i_1 - 2i_2 - 4i_3 = 20$$
$$2i_1 + 10i_2 - 18i_3 = 0$$
$$-4i_1 - 8i_2 + 18i_3 = 0$$

Answer : i0 = -5

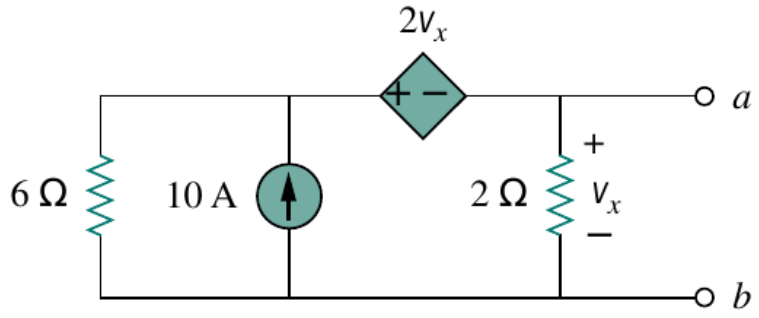
2 - Obtain the node voltage eqautions, in matrix form, for the circuit given below



Answer:

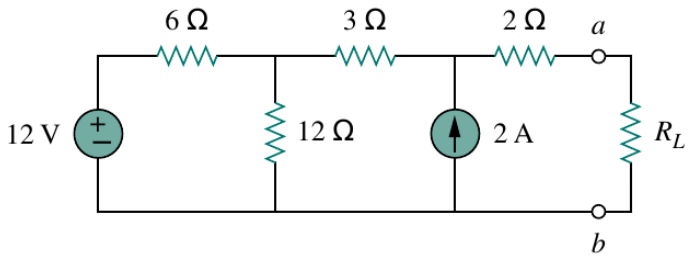
$$\begin{bmatrix} 1.3 & -0.2 & -1 & 0 \\ -0.2 & 0.2 & 0 & 0 \\ -1 & 0 & 1.25 & -0.25 \\ 0 & 0 & -0.25 & 0.75 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ -1 \\ 3 \end{bmatrix}$$

3 – Find the Norton equivalent circuit for the circuit given below



Answer: $R_N = 1\ \Omega, I_N = 10\ \text{A}.$

4 - For the circuit given below find the value of RL for maximum power transfer, also calculate the maximum power transfered



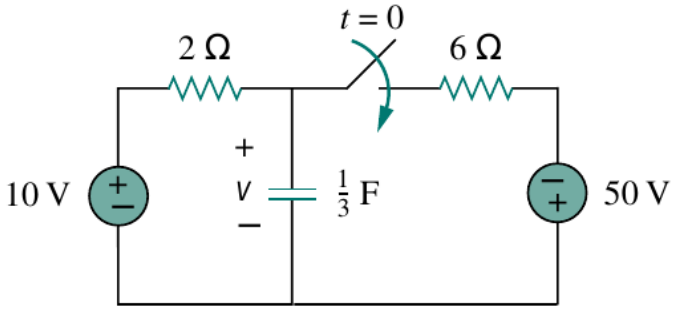
For maximum power transfer,

$$R_L = R_{\text{Th}} = 9\ \Omega$$

and the maximum power is

$$p_{\max} = \frac{V_{\text{Th}}^2}{4R_L} = \frac{22^2}{4 \times 9} = 13.44\ \text{W}$$

5 – Find v(t) for t>0 in the given circuit. Assume the switch has been open for a long time and is closed at t=0. Calculate v(t) at t=0.5 sec.



Answer: $-5 + 15e^{-2t}$ V, 0.5182 V.