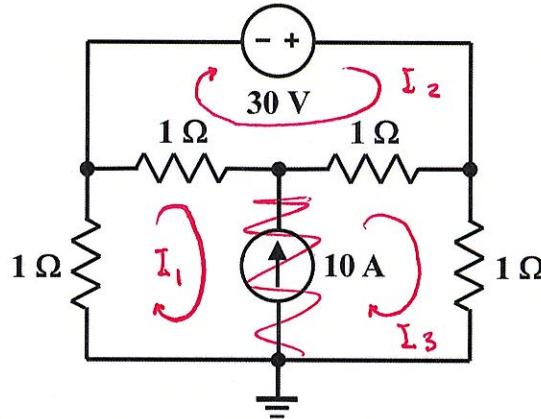


EE/EET 2240  
**Homework Problem 018**



- a. Express mesh equations in the matrix form discussed in class.

$$I_3 - I_1 = 10 \text{ A} \quad (\text{constraint equation for supermesh } 1,3)$$

$$(1\Omega)I_1 + (1\Omega)(I_1 - I_2) + (1\Omega)(I_3 - I_2) + (1\Omega)I_3 = 0$$

(KVL for supermesh 1,3)

$$-30\text{V} + (1\Omega)(I_2 - I_3) + (1\Omega)(I_2 - I_1) = 0 \quad (\text{KVL for mesh } 2)$$

In matrix form:

$$\begin{bmatrix} -1 & 0 & 1 \\ 2 & -2 & 2 \\ -1 & 2 & -1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 10 \\ 0 \\ 30 \end{bmatrix}$$

- b. Solve the equations and determine whether the 30 V source is *delivering* or *absorbing* power, and how much.

Solving yields  $I_2 = 30 \text{ A}$

Since the PSC is not satisfied, the 30V source

delivers  $(30\text{V})(I_2) = (30\text{V})(30\text{A}) = 900 \text{ W}$