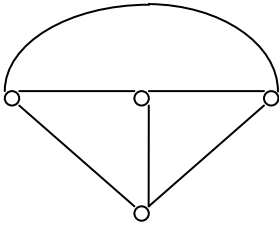


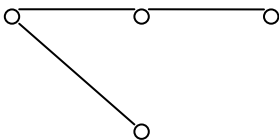
EE40 Spring 2008 Homework 2 Problem 9 Solution

9) [Hambley 2.72 modified]

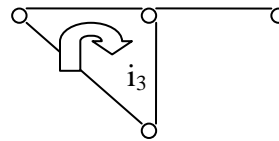
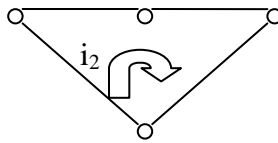
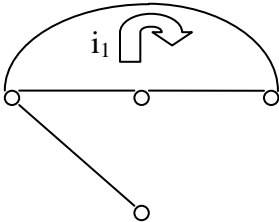
The graph of the circuit is:



We choose the tree (this is not unique):



This gives three loops, each with its associated mesh current



Note that $i_3 = -4$ is not a variable.

Writing KVL for the first mesh,

$$15 i_1 + 15(i_1 - i_2) + 15(i_1 - i_2 - i_3) = 0$$

Writing KVL for the second mesh:

$$5(i_2 + i_3) + 15(i_2 + i_3 - i_1) + 15(i_2 - i_1) + 25i_2 = 0$$

Substituting for i_3 and rearranging

$$45i_1 - 30i_2 = -60$$

$$-30i_1 + 60i_2 = 80$$

Adding $2 \cdot \text{eq1} + \text{eq2}$ gives

$$60i_1 = -40$$

Hence

$$i_1 = -2/3 \text{ A}$$

Substituting into either equation gives

$$i_2 = 1 \text{ A}$$

We get $v_3 = 25i_2 = 25 \text{ V}$.