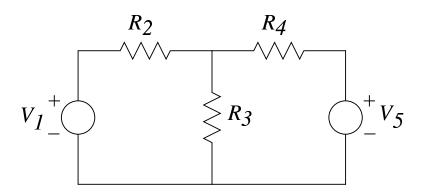**Problem S2 (Signals and Systems)**

For the circuit below, solve for all the branch currents and branch voltages, using the following steps. (Note: This problem will be easier once you learn the node method and the loop method. You should do just this one problem the long way.)

1. Label each circuit element with a branch voltage and branch current.

2. Write down Kirchhoff's voltage law for each loop in the circuit.

3. Write down Kirchoff's current law for all the nodes, except one.

4. Write down the constitutive relation for each circuit element.

5. Verify that there are as many equations as unknowns, and solve for all the unknowns. Hint: You should do this in an organized way, as there are a large number of variables.

$$V_1 = 4 \text{ V}, \ R_2 = 4 \ \Omega, \ R_3 = 6 \ \Omega, \ R_4 = 12 \ \Omega, \ V_5 = 6 \text{ V}$$