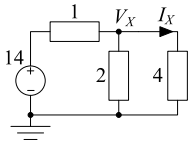
E1.1 Circuit Analysis

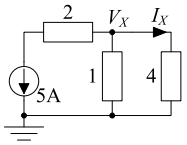
Problem Sheet 2 (Lectures 3 & 4)

Key: [A]= easy ... [E]=hard

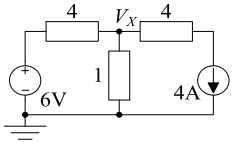
1. [B] Calculate V_X and I_X in the following circuit using (a) nodal analysis and (b) simplifying the circuit by combining parallel resistors.



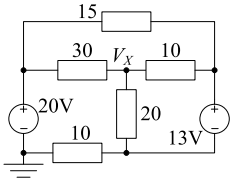
2. [B] Calculate V_X and I_X in the following circuit using (a) nodal analysis and (b) simplifying the circuit by combining parallel resistors.



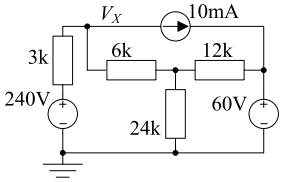
3. [C] Calculate V_X in the following circuit using (a) nodal analysis and (b) superposition.



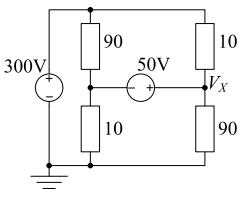
4. [C] Calculate V_X in the following circuit.



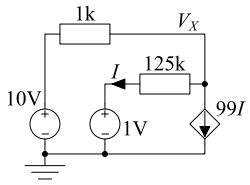
5. [C] Calculate V_X in the following circuit.



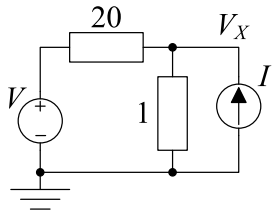
6. [C] Calculate V_X in the following circuit.



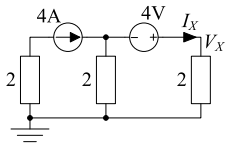
7. [C] Calculate V_X in the following circuit. The value of the dependent current source is 99 time the current flowing through the 1 V voltage source.



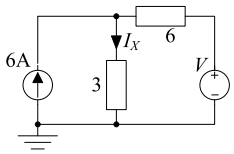
8. [C] In the following circuit calculate V_X in terms of V and I using (a) nodal analysis and (b) superposition.



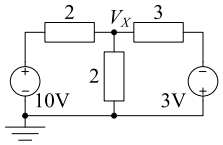
9. [C] Calculate V_X and I_X in the following circuit using (a) nodal analysis and (b) superposition.



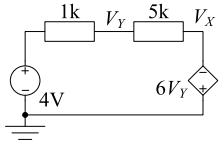
10. [C] Determine an expression for I_X in terms of V in the following circuit. Determine the value of V that will make $I_X = 0$.



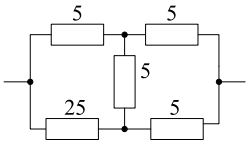
11. [C] Calculate V_X in the following circuit using (a) nodal analysis and (b) superposition.



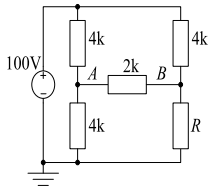
12. [C] Calculate V_X in the following circuit which includes a dependent voltage source.



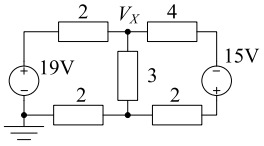
13. [C] Find the equivalent resistance of the network shown below.



14. [D] Prove that if $V_{AB} = 0$, then $R = 4\,\text{k}\Omega$ in the following circuit. The circuit is used to detect small changes in R from its nominal value of $4\,\text{k}\Omega$. Find an expression for V_{AB} as a function of R. If changes in V_{AB} of $10\,\text{mV}$ can be detected, what is the smallest detectable change in R .



15. [D] Calculate V_X in the following circuit. You can either use nodal analysis directly or else simplify the circuit a little to reduce the number of nodes.



16. [D] Calculate V_X in the following circuit which includes a floating dependent voltage source.