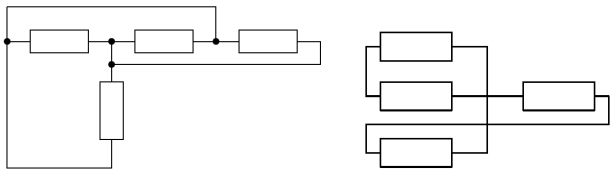
Design Engineering – DE 1.3 Electronics

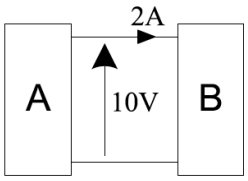
Problem Sheet 1 (Topics 1 - 4)

Key: [A] = easy …… [E] = hard

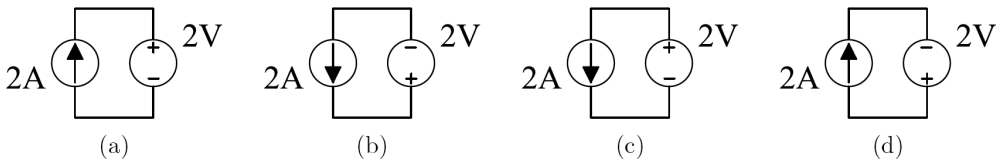
1. [A] One of the following circuits is a series circuit and the other is a parallel circuit. Explain which is which.



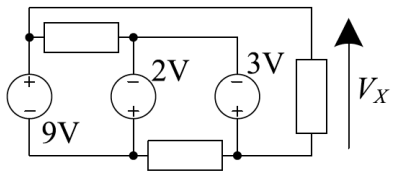
2. [B] Find the power absorbed by by each of the sub circuits A and B given that the voltage and current are 10V and 2A as shown.



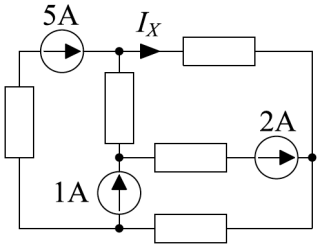
3. [B] For each of the four circuits below, find the power absorbed by the voltage source (P_V), the power absorbed by the current source (P_I) and the total power absorbed ($P_V + P_I$).



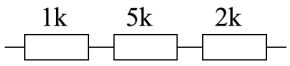
4. [B] Determine the voltage V_X in the following circuit.



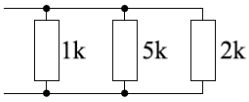
5. [B] Determine the current I_X in the following circuit.



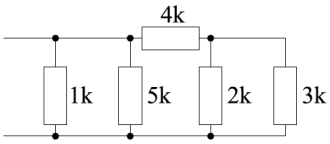
6. [B] What single resistor is equivalent to the three-resistors sub-circuit shown below?



7. [B] What single resistor is equivalent to the three-resistors sub-circuit shown below?

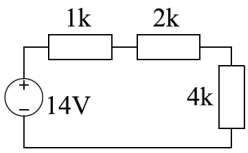


8. [C] What single resistor is equivalent to the five-resistors sub-circuit shown below?

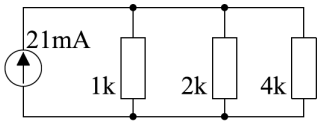


9. [A] If a resistor has a conductance of 8 μS, what is its resistance?

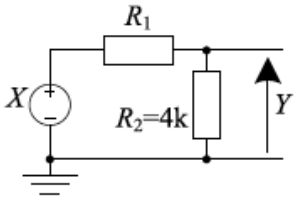
10. [B] Determine the voltage across each of the resistors in the following circuit and the power dissipated in each of them. Calculate the power supplied by the voltage source.



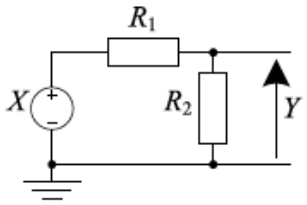
11. [B] Determine the current through each of the resistors in the following circuit and the power dissipated in each of them. Calculate the power supplied by the current source.



12. [B] Determine R1 so that Y = (1/4) X.



13. [B] Choose R1 and R2 so that Y = 0:1X and R1 + R2 = 10 MΩ.



14. [D] You have a supply of resistors that have the values {10; 12; 15; 18; 22; 27; 33; 39; 47; 56; 68; 82} x 10^n Ω for all integer values of n. Thus, for example, a resistor of 390Ω is available and the next higher value is 470Ω. Show how, by combining two resistors in each case, it is possible to make networks whose equivalent resistance is (a) 3 kΩ, (b) 4 kΩ and (c) as close as possible to 3.5 kΩ. Determine the worst-case percentage error that might arise if, instead of combining resistors, you just pick the closest one available.