

EEE117 Problem Sheet

Sources, Resistors and Circuits

Q1 The circuit of figure 1 shows a 5A current source connected to a 3V voltage source.

- (i) What is the value of I_S ? [-5A]
- (ii) One source is acting as an energy source and the other as an energy sink; which one is acting as an energy source? [5A]
- (iii) How much power is the driving source delivering? [15W]

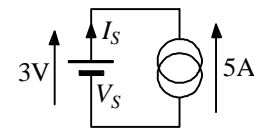


Figure 1

Q2 For the circuit diagrams of figure 2, identify the the circuits by which the source can drive current from its positive end, around a circuit to its negative end. Define the circuits by writing down the current path in terms of node numbers and components (eg: 7, R_4 , 3, R_6 , 1, R_2 , 5). [1, R_1 , 2; 1, R_1 , 2, R_2 , 4; 1, R_1 , 2, R_3 , 4, R_2 , 3; 1, R_1 , 3, R_2 , 2 and 1, R_1 , 3, R_3 , 2; 1, R_1 , 2 and 1, R_2 , 3, R_4 , 2 and 1, R_3 , 3, R_4 , 2; 1, R_1 , 2 and 1, R_3 , 4, R_5 , 2]

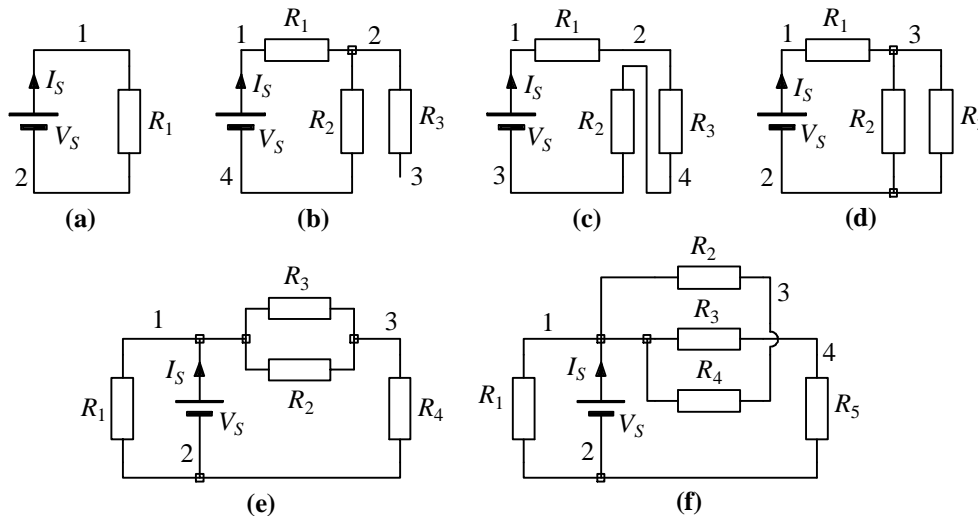


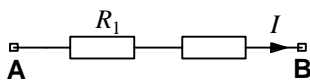
Figure 2

Q3 In the circuits of figure 2, $R_1=1\Omega$, $R_2=2\Omega$, $R_3=3\Omega$, $R_4=4\Omega$, $R_5=5\Omega$ and $V_S=10V$.

- (i) Find I_S for each circuit. [10.00A, 3.33A, 1.67A, 4.55A, 11.92A, 11.25A]
- (ii) Find the voltage across R_3 for each of circuits (b) to (e) giving the node number at the positive end of that voltage difference in each case. [0V; 5V, 2; 5.45V, 3; 2.31V, 1; 3.75V, 1]
- (iii) For each circuit, find the power delivered by the source and the power dissipated in R_2 (where R_2 exists). [100,-; 33.3,22.2; 16.7,5.6; 45.5,14.9; 119.2,2.7; 112.5,0; units all W]

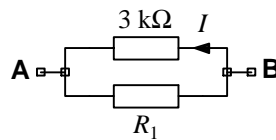
Q4 The resistors in this question all have a resistance of $1\text{ k}\Omega$ unless indicated otherwise. For parts (4.1) to (4.9) of this question evaluate

- (i) the resistance between terminals **A** and **B**
- (ii) the current, I , assuming that the network is driven by a 10 V source with its positive end at **A**
- (iii) the voltage across R_1 in each circuit.
- (iv) the value of I if the 10 V voltage source was changed into a 10 mA current source driving a positive current into node **A**



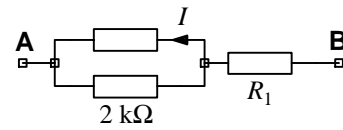
4.1

[$2\text{ k}\Omega$, 5 mA , 5 V , 10 mA]



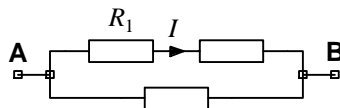
4.2

[$750\text{ }\Omega$, -3.33 mA , 10 V , -2.5 mA]



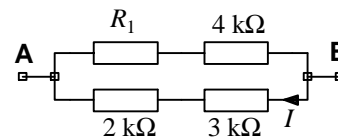
4.3

[$1.67\text{ k}\Omega$, -4 mA , 6 V , -6.7 mA]



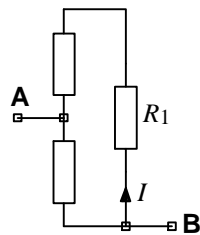
4.4

[$667\text{ }\Omega$, 5 mA , 5 V , 3.33 mA]



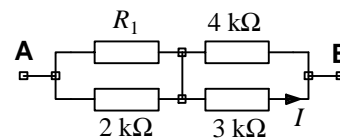
4.5

[$2.5\text{ k}\Omega$, -2 mA , 2 V , -5 mA]



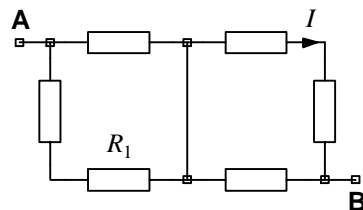
4.6

[$667\text{ }\Omega$, -5 mA , 5 V , -3.33 mA]



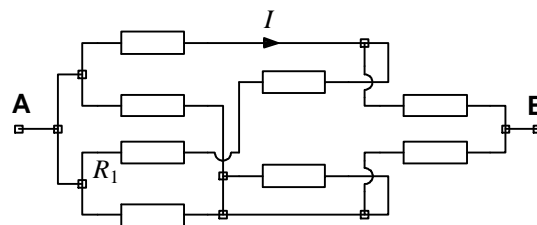
4.7

[$2.38\text{ k}\Omega$, 2.4 mA , 2.8 V , 5.7 mA]



4.8

[$1.33\text{ k}\Omega$, 2.5 mA , 2.5 V , 3.33 mA]



4.9

[$789\text{ }\Omega$, 4 mA , 2 V , 3.16 mA]