**The University of Sheffield**
**Department of Electronic and Electrical Engineering**

# EEE101 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]

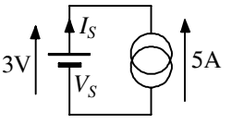



**Figure 1**

**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]

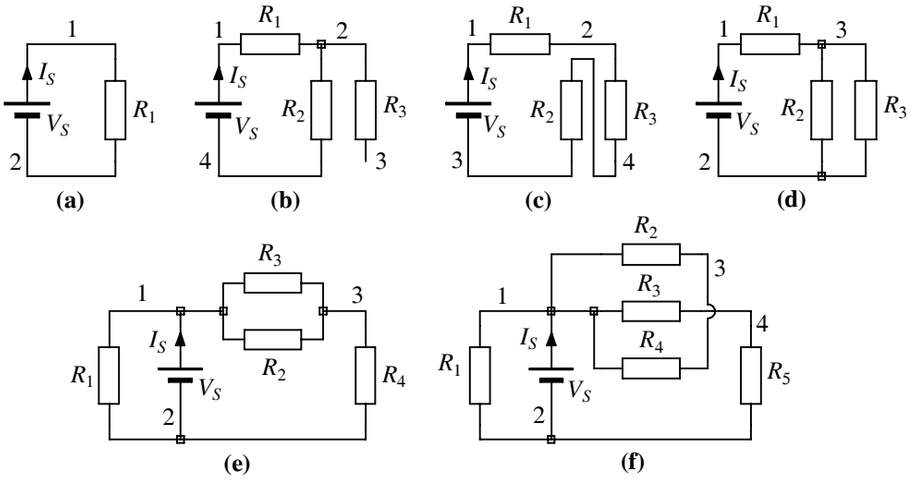



**Figure 2**

**Q3** In the circuits of figure 2, $R_1$=1Ω, $R_2$=2Ω, $R_3$=3Ω, $R_4$=4Ω, $R_5$=5Ω 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]

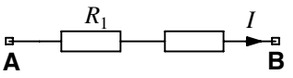
**Q4** The resistors in this question all have a resistance of 1 kΩ unless indicated otherwise. For parts **(4.1)** to **(4.9)** of this question evaluate

**(i)** the resistance between terminals **A** and **B**

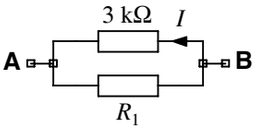
**(ii)** the current, $I$, assuming that the network is driven by a 10 V source with its positive end at **A**

**(iii)** the voltage across $R_1$ in each circuit.

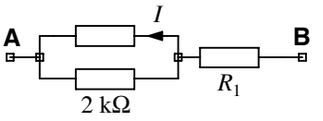
**(iv)** the value of I if the 10 V voltage source was changed into a 10 mA current source driving a positive current into node **A**



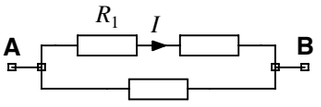

**4.1**



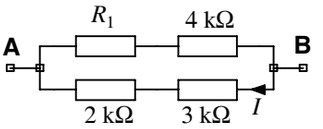

**4.2**



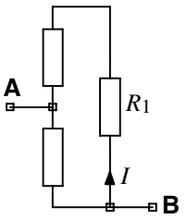

**4.3**



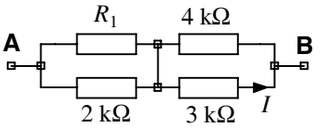

**4.4**



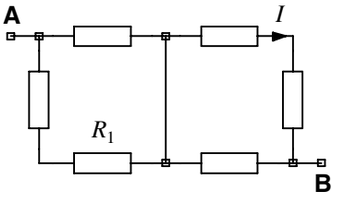

**4.5**



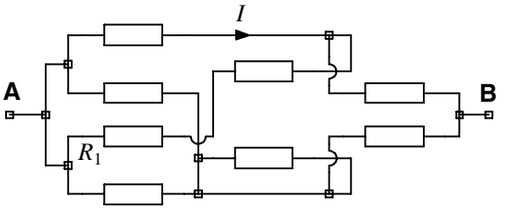

**4.6**




**4.7**




**4.8**




**4.9**