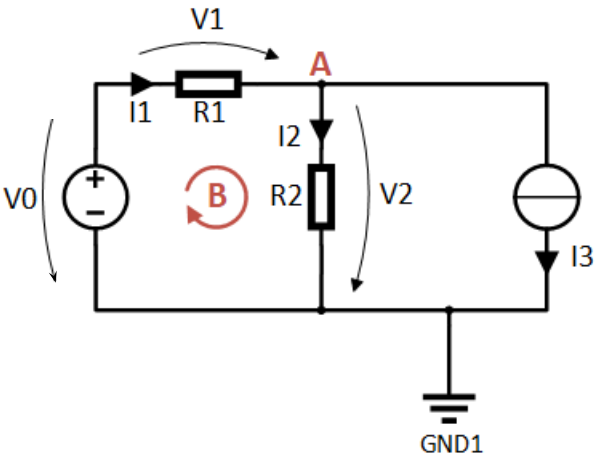
ELEC-C9610 Basics in Electronics

Calculation assignment 1. Deadline 14:00, September 14th, 2022

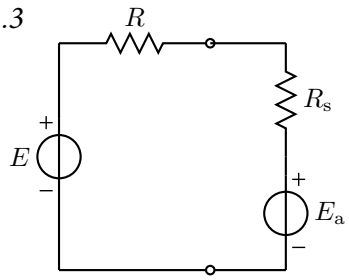
1.1 Explain what the Kirchhoff's laws define. Apply the laws to a node "A", loop "B" of the following circuit, and formulate two equations corresponding to the Kirchhoff's laws.



1.2 You have a box containing an unlimited number of 10 kΩ resistors. Show how to connect some of these together to construct equivalent resistances with the following values:

a) 20 kΩ
b) 25 kΩ
c) 6.667 kΩ
d) 3.33 kΩ

1.3



A battery, with an open-circuit voltage E_a and internal resistance R_s, is charged by a voltage source E through resistance R as shown in the figure. By using Kirchoff's laws, Ohm's law and the expression of power seen in the lecture, determine R so that the power flowing into the voltage source of the battery is P_{E_a}.

$$E_a = 12\ \text{V} \quad R_s = 0.1\ \Omega \quad E = 20\ \text{V}$$
$$P_{E_a} = 40\ \text{W}.$$