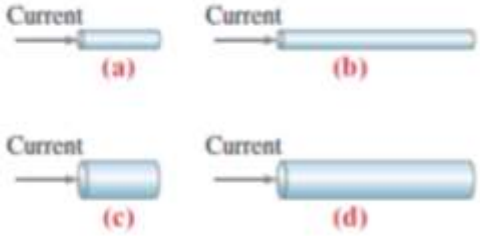
VICTORIA
UNIVERSITY OF WELLINGTON
TE WHARE WĀNANGA
O TE ŪPOKO O TE IKA A MĀUI

ENGR142 2018, 2nd Trimester
Lecturers: B. Ruck, F. Natali, and C. Hollitt

Assignment 6 Due date: 11:59 PM, Sunday 23rd September, 2018

Problem 1: Resistance basics *(5 marks)*

(a) The conductors shown below are all made of aluminium and are at the same temperature.
(i) Which conductor would have the greatest resistance to the flow of charge entering from the left?
(ii) Which would offer the least resistance?



(b) How much will the electrical resistance of a wire change, if the diameter of wire is doubled?

Problem 2: Current is flow of charge *(5 marks)*

A steady current of 3 A exits in a wire for 5 minutes.

(a) How much total charge passes by a given point in the wire during those 5 minutes?
(b) How many electrons would this be?

Problem 3: Speaker wires *(5 marks)*

Suppose you want to connect your stereo to remote speaker.

(a) If each wire must be 20 meter long, what diameter copper wire should you use to keep the resistance less than 0.1Ω per wire?
(b) If the current to each speaker is 4.0A, what is the potential difference, or voltage drop, across each wire?

Problem 4: Temperature dependent resistance *(5 marks)*

Platinum wire can be used to make precise temperature measurements. The resistance of a conductor, including platinum, varies approximately linearly with the temperature such as: $R = R_o[1 + \alpha(T - T_o)]$, where R_o is the resistance at room temperature T_o (20°C), α is the **temperature** coefficient of resistivity (SI units of α are $^oC^{-1}$). The temperature coefficient of resistivity α of platinum is $3.927 \times 10^{-3}\ ^oC^{-1}$. Suppose at a temperature T_o, the resistance of platinum is 164.2Ω. When placed in a particular solution (i.e. liquid), the resistance is 187.4Ω.

(a) What is the temperature of the solution?