University of Alberta
Department of Chemical and Materials Engineering

Lecturer: Dr. Stojan Djokić

MAT E 201
Materials Science I

Assignment No.7 **(15 marks)**

March 6, 2020
Due Date: March 13, 2020 by 3:00 pm

1. A current of 20 A is passed through a 3 mm diameter wire 1000 m long. Calculate the power loss if the wire is made of a) aluminum, b) nickel, and c) silicon carbide (SiC) **(3 marks)**

2. 0.5 mm diameter fibre, 0.7 cm in length made of aluminium arsenide (AlAs) is placed into a 110 V circuit. Calculate: a) the current flowing in the circuit, and b) the number of electrons passing through the AlAs fibre per second. **(3 marks)**

3. The power lost in a 0.3 mm diameter copper wire is to be less than 300 W when a 5 A current is flowing in the circuit. What is the maximum length of wire? **(3 marks)**

4. A voltage of 5000 V is applied to copper wire 1000 m in length. Calculate the diameter of wire and current density if the resistance of copper is 5 ohm. **(3 marks)**

5. Suppose we estimate that the mobility of the electrons in silver is 85 cm^2/Vs. Estimate the fraction of the valence electrons that are carrying an electrical charge. **(3marks)**