# SIMON FRASER UNIVERSITY
# SCHOOL OF ENGINEERING SCIENCE

## Fall 2008
## ENSC 220: ELECTRIC CIRCUITS I

Midterm Examination
Thursday, October 23, 2008

*Duration: 110 minutes. Attempt all problems. Questions are* **not** *equally weighted. Closed book and closed notes. Calculators, PDAs, laptops, and wireless phones are not permitted.*

1. **(10 points)**

   In the circuit shown in Figure 1, find the power absorbed by the load $R_L$. Use an appropriate unit for the calculated power.

2. **(20 points)**

   For the circuit shown in Figure 2 with $I_1 = 0.4A$:

   - Write nodal equations.
   - Find voltages $V_A$, $V_B$, and $V_x$.

3. **(20 points)**

   In the circuit shown in Figure 3 with $V_{s1} = 250V$ and $I_{s2} = 0.75A$:

   - Write mesh equations.
   - Find $I_x$.
   - Find the power delivered by all the sources in the circuit.

4. **(20 points)**

   The operational amplifier shown in Figure 4 is ideal.

   - Find the output voltage $V_o$.
   - Find a relationship among resistors such that the output is proportional to the difference of the two input voltages. This circuit may be used as a difference amplifier.

5. **(30 points)**

   For the circuit shown in Figure 5:

   - Find the Thévenin's equivalent for the circuit seen left of $R_L$.
   - Determine the value of $R_L$ required for maximum power transfer.
   - Determine maximum power that can be absorbed by $R_L$.

Figure 1.

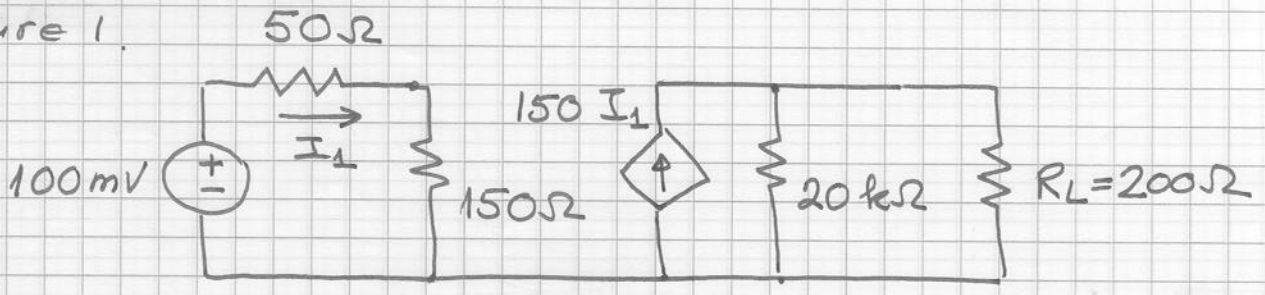


Figure 2.

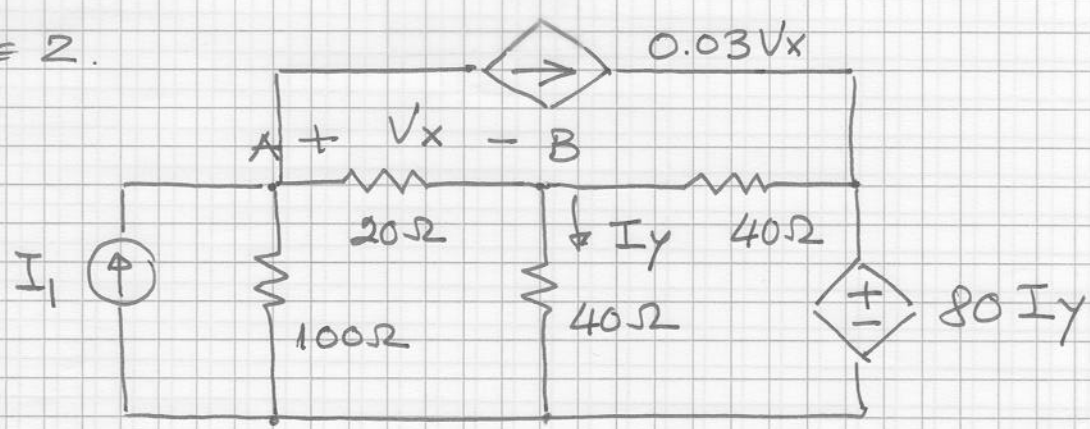


Figure 3.

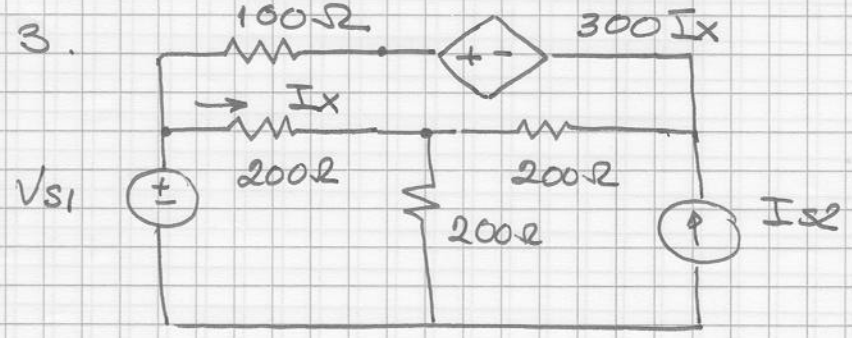


Figure 4.

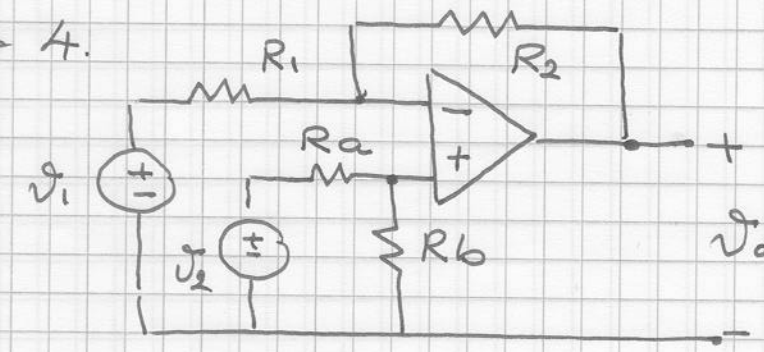


Figure 5.