SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

ENSC 220
ELECTRIC CIRCUITS I

Midterm Examination No. 2
November 6, 1998

Attempt all four problems.
Problems are equally weighted.

1. In the op-am circuit shown in Figure 1., the op-amp input resistance is R_i, the op-amp output resistance is R_o, and the op-amp gain is A. Write the **nodal equations** for the circuit. What is the output voltage of the op-amp in terms of node voltages?

2. The one-transistor amplifier circuit is shown in Figure 2. (The BJT transistor is modeled with the circuit connected between terminals B-C-E.) Find the Thévenin's equivalent voltage V_T seen between the base (B) and the emitter (E) terminals by writing the **nodal equations** for the **appropriate circuit**.

3. For the circuit shown in Figure 2, find the Thévenin's equivalent resistance R_T seen between the base (B) and the emitter (E) terminals by writing the **mesh equations** for the **appropriate circuit**. Check you result by setting $\beta = 0$ and by looking at the resulting circuit. Check again, now by setting both $\beta = 0$ and $R = \infty$.

4. What is the number of independent **nodal** equations and the number of independent **mesh** equations for the circuit shown in Figure 3? Which of these two methods produces the **least number** of independent equations? Write this set of equations.

FIGURES:

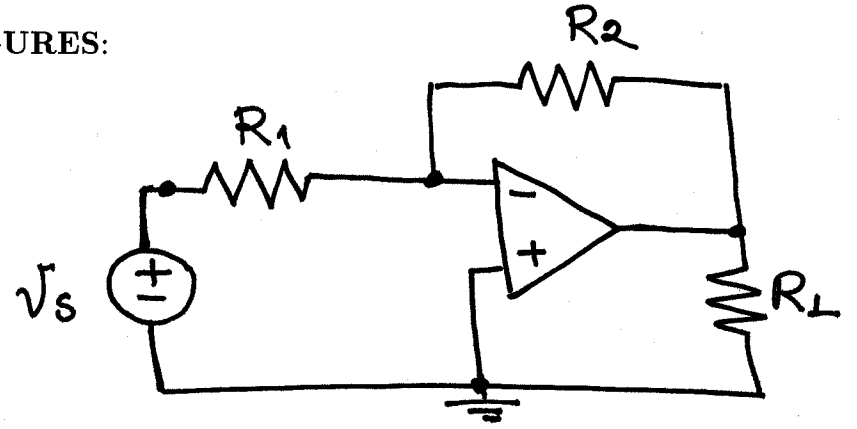

Fig. 1

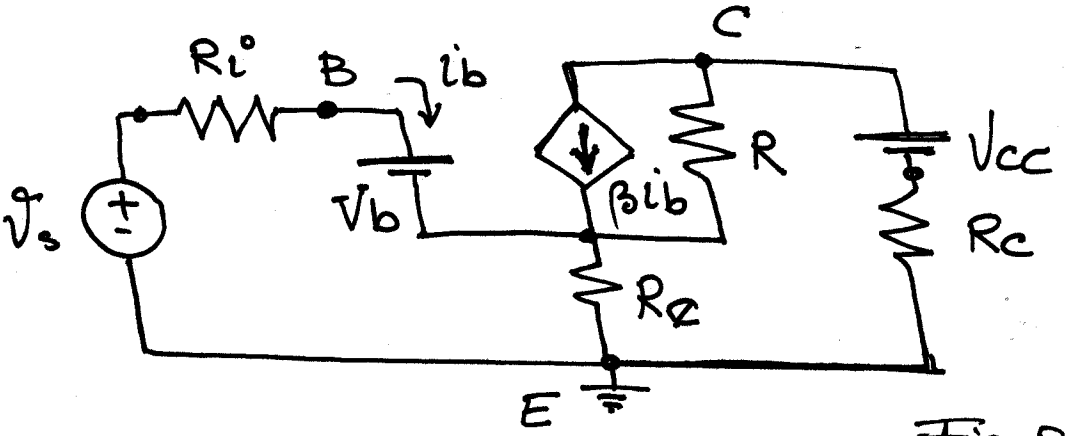

Fig. 2

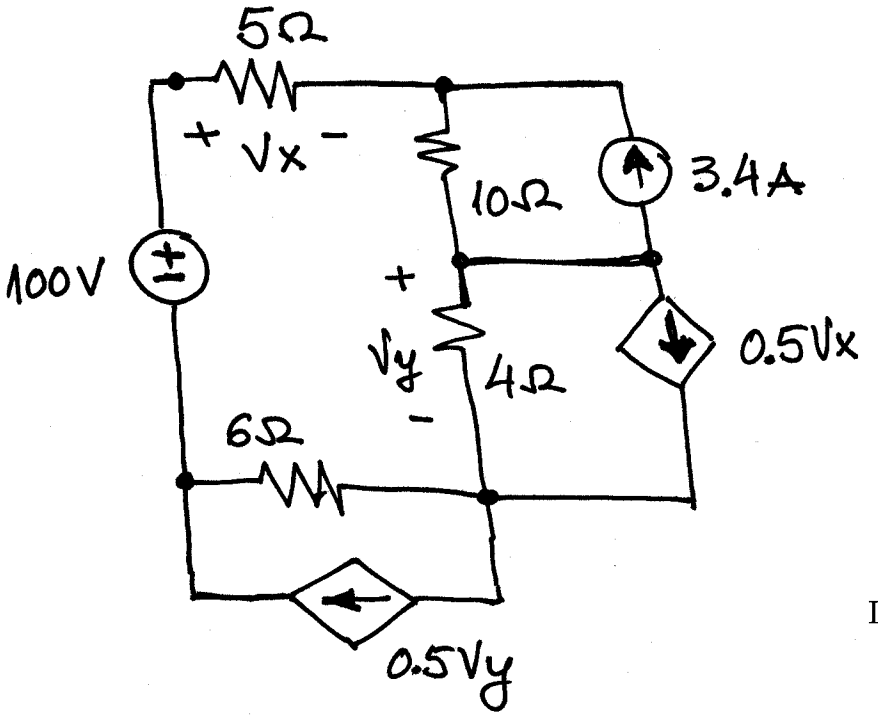

Fig. 3

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