

ENSC 220 mid Term (Oct. 14, 2004)

This test is OPEN BOOK: Time: 90 minutes

Any book, notes and calculator may be used, but not a computer.

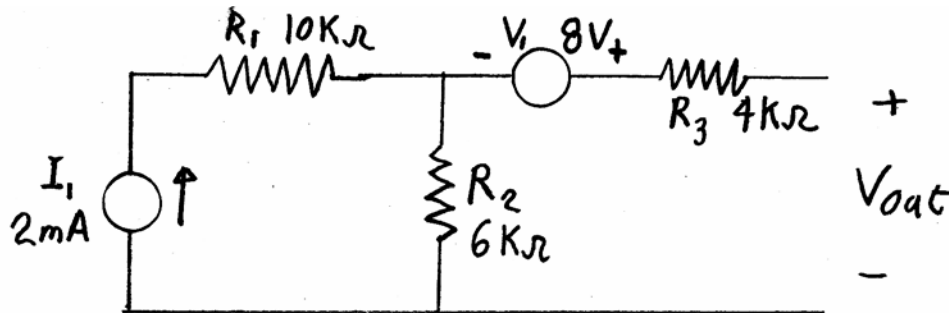
NOTE: Do 2 questions in part I 25 marks each for a total of 50 marks
Do 1 question in part II for 50 marks.
Test Total is 100 marks.

Section 1: Do 2 of these 3 questions: 25 marks each

(1) For the circuit below

(a) Find the Thevenin equivalent of the circuit. What is the alternative method of obtaining the Thevenin values from the one you used, and what is the advantage of choosing the one you did. (20 marks)

(b) Find the Norton equivalent of the same circuit. (5 marks)

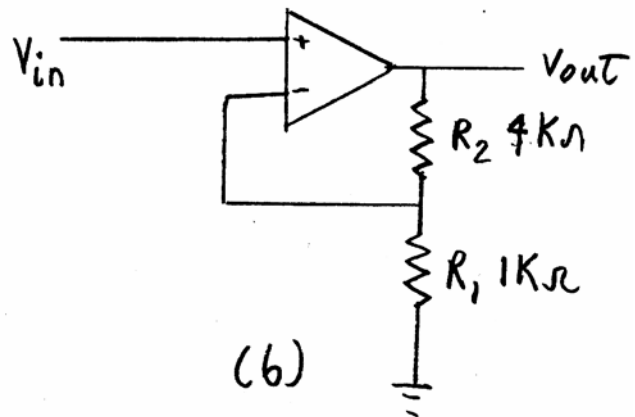
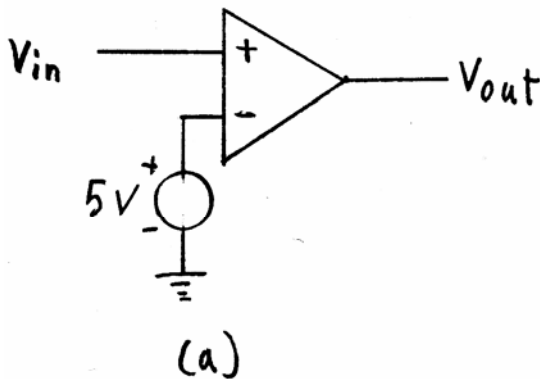


(2) In the following operational amplifier questions assume $V_{CC} = +15\text{ V}$ and $V_{EE} = -15\text{ V}$ and ideal op amps. In all design sections use a 1 Kohm resistor as the smallest resistor in the circuit.

(a) Draw the response of the op-amp circuit (a) below as the input voltage is varied from -20 to +20 V (plot the IV characteristics). (8 marks)

(b) Draw the response of the op-amp circuit (b) below as the input voltage is varied from -5 to +5 V. What type of op amp circuit is this? (8 marks)

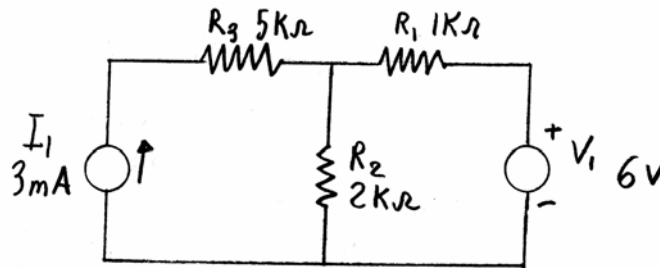
(c) Draw an op-amp circuit to give an output voltage that is exactly equal to the input voltage. What are the upper and lower limits on the input voltage for that result? (9 marks)



(3) Using superposition (substitution) on the circuit below

(a) Sketch the 2 superposition circuits (5 marks)

(b) In the combined superposition circuit analyses determine the current flowing in each resistor, the voltage across it plus the current and voltage supplied by each source. (20 marks)

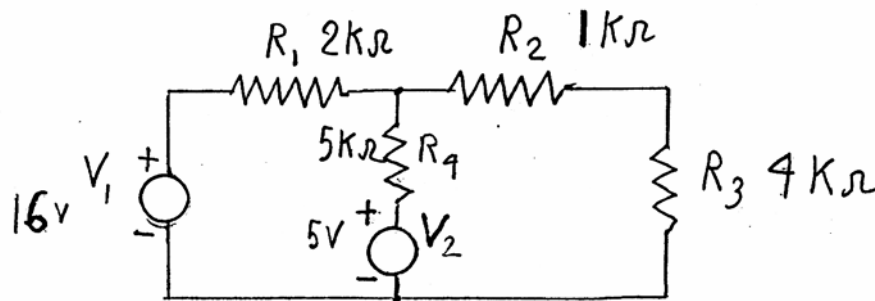


Section 2: Do 1 of these 2 questions: 50 marks each

(4) For the following circuit

(a) Write the mesh equations. (10 marks)

(b) Analysis the circuit for current and voltage for each element. As part of this state a formula for one mesh current in terms of the other. (40 marks)



(5) For the following circuit

(a) Write the node equations. (8 marks)

(b) Analysis the circuit for current and voltage for each element. As part of this state a formula for one node voltage in terms of the other (ie. the relationship between the two node voltages). (40 marks)

(c) Which resistor(s) have no effect on the node voltages as determined by those equations. (2 marks)

