EEE 31 Problem Set 2

Instructions:

1. Write your name, student number, section and professor's name at the upper right corner on each page of your answer sheet. Staple sheets together.
2. Use only the front pages of your answer sheet. Anything written at the back side of your paper will be considered scratch work.
3. Answer each problem with complete solutions. Fractional answers must be in simplest form. **Box your final answers.**

Problem 1

Use source transformation to find the following:

a. (8 pts) Voltage across RL if RL = 150Ω
b. (2 pts) The value of RL to achieve maximum power transfer

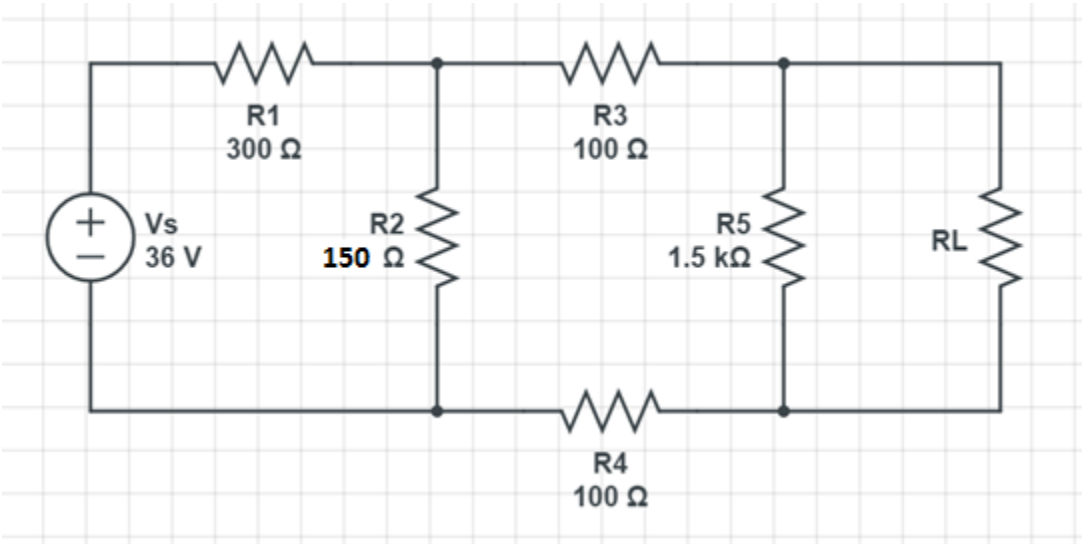

Figure 1. For Problem 1.

Problem 2

Use Figure 2 to answer this problem.

a. (8 pts) Find the Norton and Thevenin equivalent circuit seen across Vx using source transformation.
b. (2 pts) Find the value of Vx.

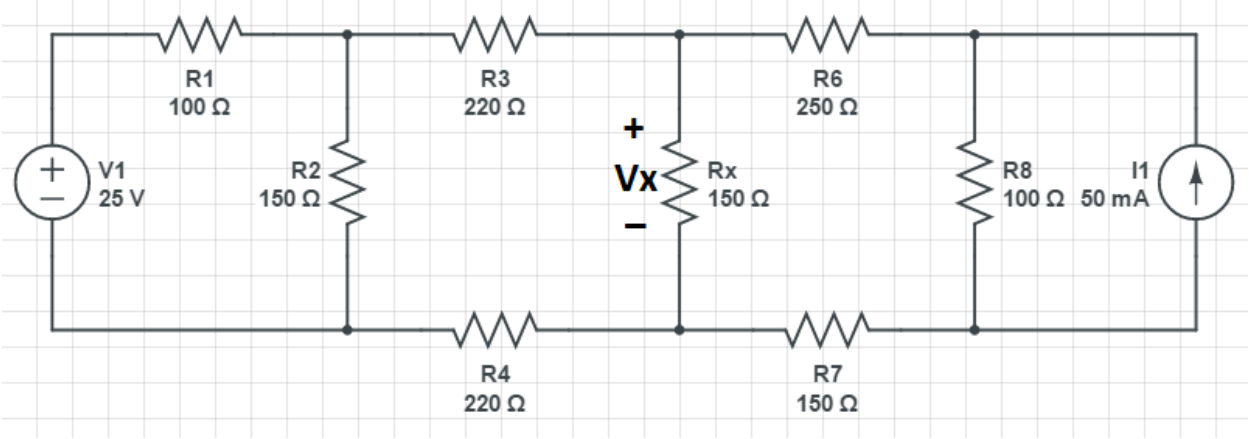

Figure 2. For problem 2 and 3.

Problem 3

Use the superposition principle and source transformation to solve the value of Vx in Fig 2. Show your complete solution. (10 pts)

Problem 4

If R1 = R2 = R3 = R4 = R5 = Rf = 1Ω, find an expression for Vo in terms of V1, V2, V3 and V4. (10 pts)

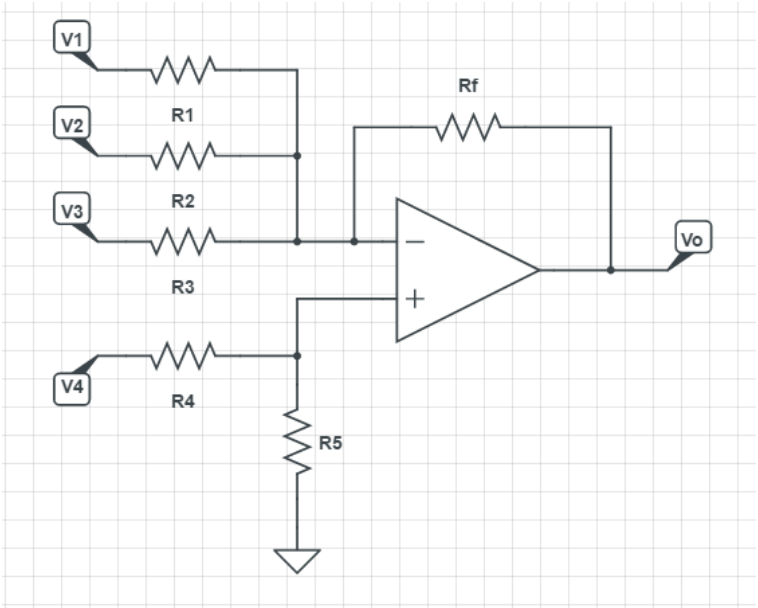

Figure 3. For problem 4.

Problem 5

Use Fig. 4 to answer the following:

a. (3 pts) Find an expression for Va in terms of V1.
b. (3 pts) Find an expression for Vb in terms of V2.
c. (4 pts) Find an expression for Vout in terms of V1 and V2.

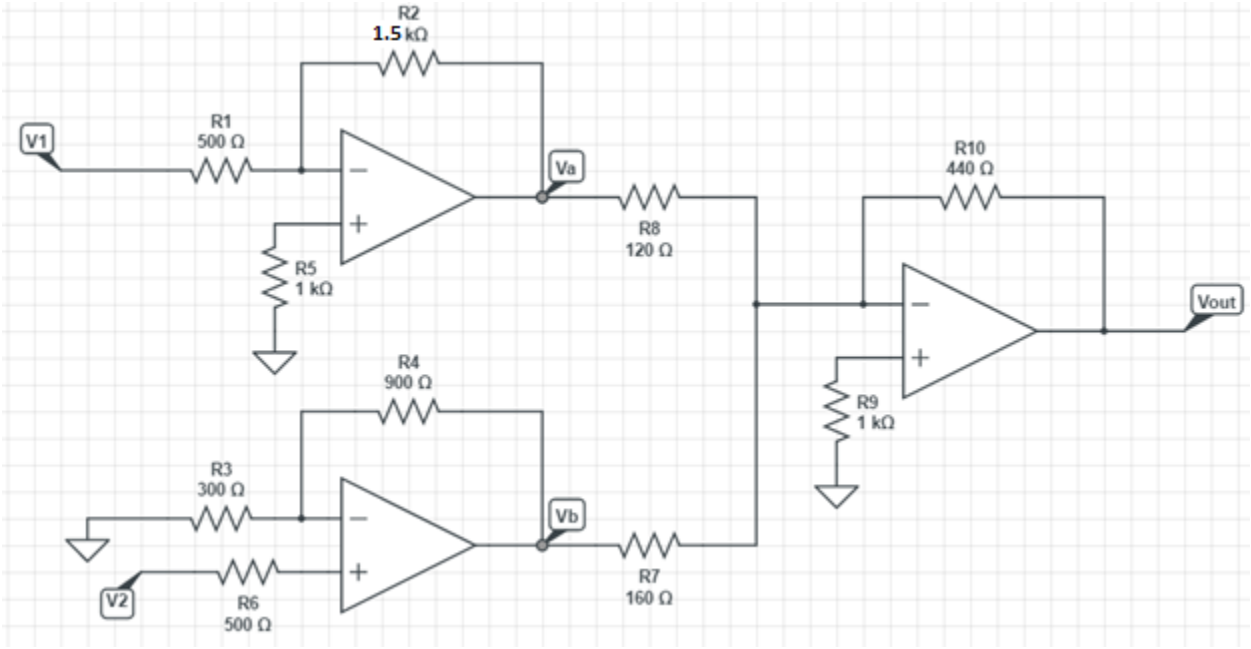

Figure 4. For problem 5.

Problem 6

a. (2 pts) Describe the op-amp circuit in Fig.4 (or Problem 5).
b. (8 pts) Design a single op-amp circuit that will do the same function of the op-amp circuit in Figure 4.

Guidelines for design:

- Single Output Vout.
- Two intpus: V1 and V2
- Vout is a function of V1 and V2
- Use only one op-amp
- Provide equations to prove that it has the same function.

Problem 7

The circuit shown in figure 5 has a triangle wave input shown in figure 6.

a. (3 pts) Plot the voltage Vx if the diode is shorted.
b. (7 pts) Plot the voltage Vx if the diode is an ideal voltage-triggered switch. (hint: shorted when V>0, open when V<0)

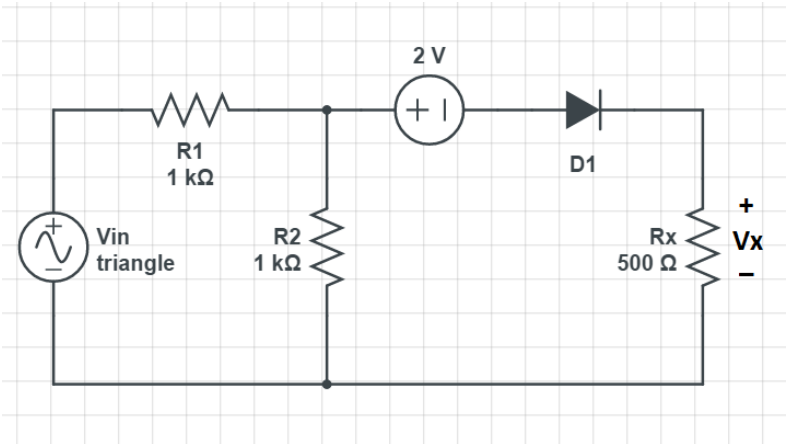

Figure 5

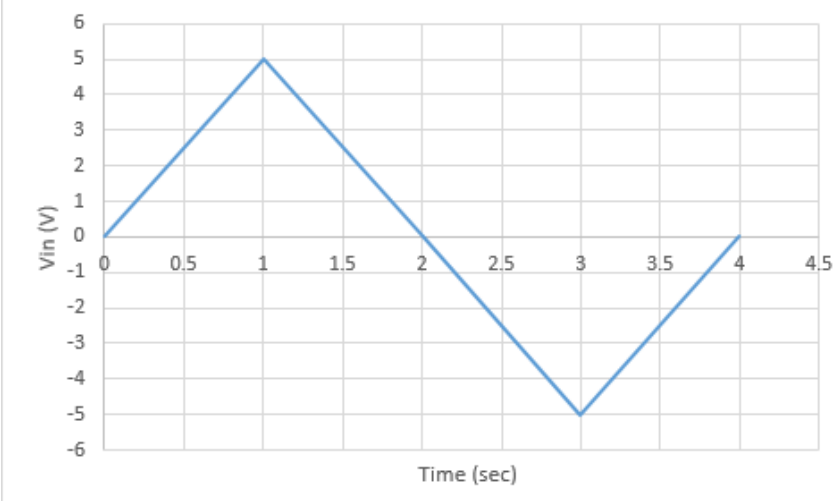

Figure 6

Problem 8

Use figure 7 to answer the following:

a. (5 pts) Find the value of Vout1 and Vout2 if V1 = 10V and V2 = 6V.
b. (3 pts) Find the currents across all resistors R1, R2, R3, R4 and R5. Name them i_1 , i_2 , i_3 , i_4 and i_5 , respectively.
c. (2 pts) Find the value of i_{out1} and i_{out2}.

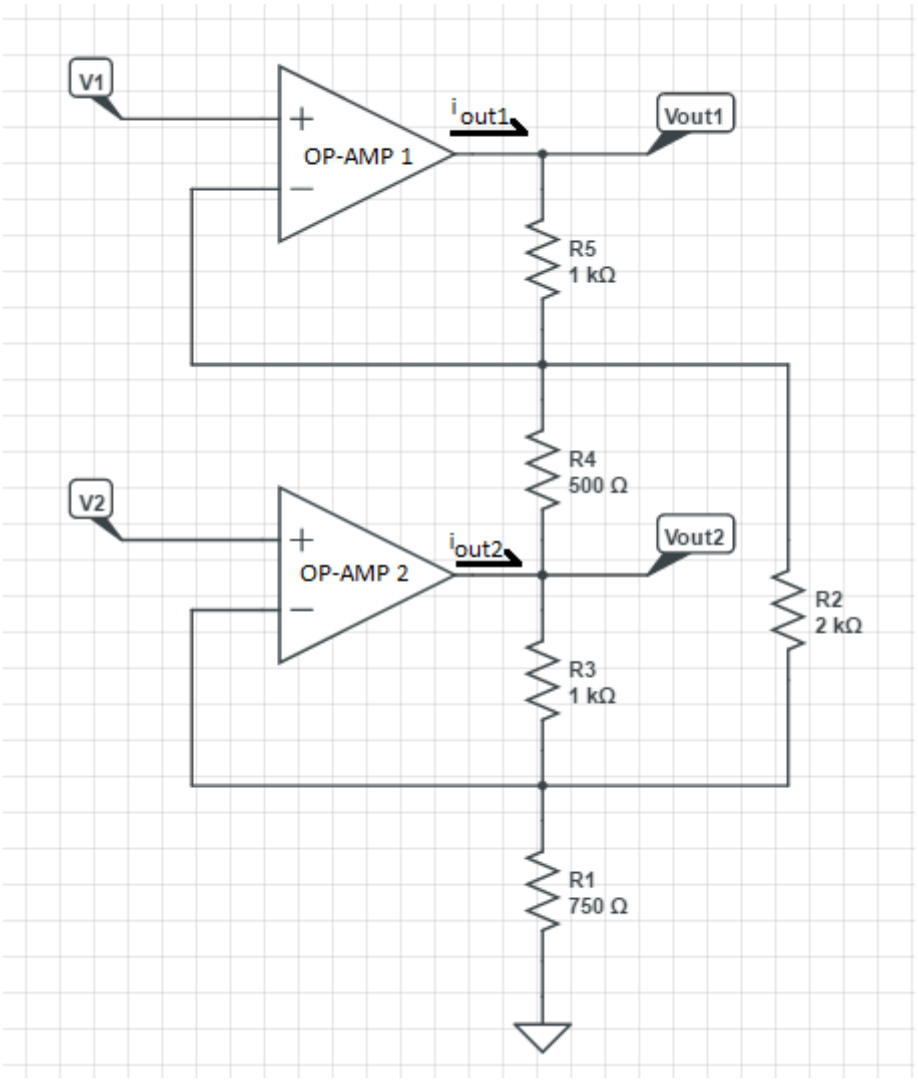

Figure 7. For Problem 8.