

EEEE273 - Quiz 4 [Question Set 1]
 SEMESTER 1, ACADEMIC YEAR 2012/2013
 Date: 30 August 2012

Question:

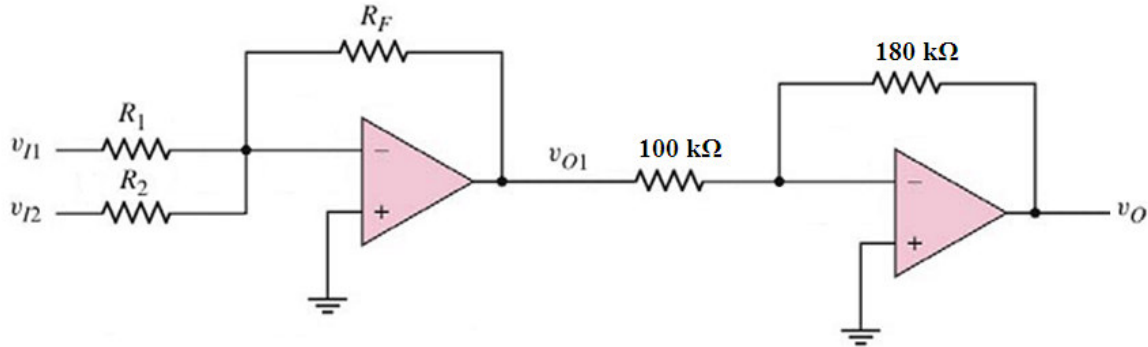


Figure 1

Refer to **Figure 1**. Using ideal properties of the op-amps:

- (a) Determine v_{O1} when $R_1 = 10 \text{ k}\Omega$, $R_2 = 24 \text{ k}\Omega$, $R_F = 30 \text{ k}\Omega$, $v_{I1} = 25 \text{ mV}$, and $v_{I2} = -10 \text{ mV}$. [6 marks]
- (b) Find v_O . [4 marks]

Show clearly all calculations in order to get full marks.

Answers:

(a)

Superposition theorem:

$$v_{I2} = 0, \quad v_{O1}(v_{I1}) = -(R_F / R_1)(v_{I1}) = -(30\text{k}/10\text{k})(25\text{m}) = -75 \text{ mV} \quad [2]$$

$$v_{I1} = 0, \quad v_{O1}(v_{I2}) = -(R_F / R_2)(v_{I2}) = -(30\text{k}/24\text{k})(-10\text{m}) = 12.5 \text{ mV} \quad [2]$$

$$v_{O1} = v_{O1}(v_{I1}) + v_{O1}(v_{I2}) = (-75\text{m}) + (12.5\text{m}) = -62.5 \text{ mV} \quad [2]$$

(b)

$$v_O = -(180\text{k}/100\text{k})(v_{O1}) = -(180\text{k}/100\text{k})(-62.5\text{m}) = 112.5 \text{ mV} \quad [4]$$

EEEE273 - Quiz 4 [Question Set 2]
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Question:

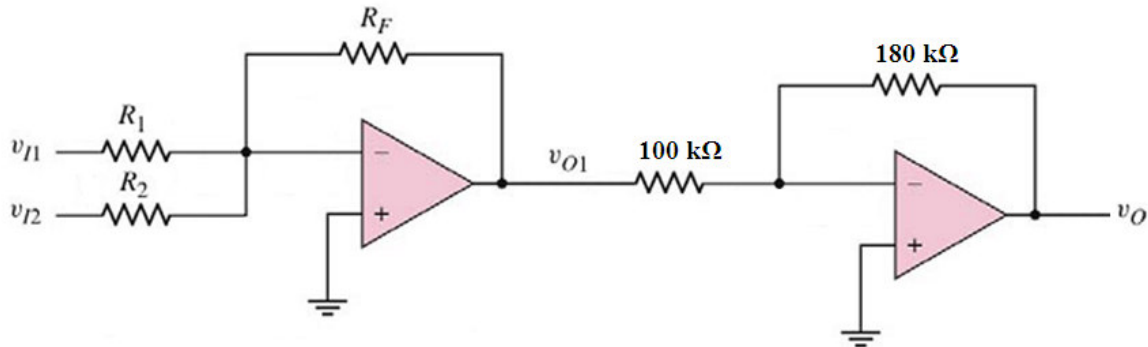


Figure 1

Refer to **Figure 1**. Using ideal properties of the op-amps:

- (c) Determine v_{O1} when $R_1 = 10 \text{ k}\Omega$, $R_2 = 24 \text{ k}\Omega$, $R_F = 30 \text{ k}\Omega$, $v_{I1} = -25 \text{ mV}$, and $v_{I2} = 10 \text{ mV}$. [6 marks]
- (d) Find v_O . [4 marks]

Show clearly all calculations in order to get full marks.

Answers:

(a)

Superposition theorem:

$$v_{I2} = 0, \quad v_{O1}(v_{I1}) = -(R_F / R_1)(v_{I1}) = -(30\text{k}/10\text{k})(-25\text{m}) = 75 \text{ mV} \quad [2]$$

$$v_{I1} = 0, \quad v_{O1}(v_{I2}) = -(R_F / R_2)(v_{I2}) = -(30\text{k}/24\text{k})(10\text{m}) = -12.5 \text{ mV} \quad [2]$$

$$v_{O1} = v_{O1}(v_{I1}) + v_{O1}(v_{I2}) = (75\text{m}) + (-12.5\text{m}) = 62.5 \text{ mV} \quad [2]$$

(b)

$$v_O = -(180\text{k}/100\text{k})(v_{O1}) = -(180\text{k}/100\text{k})(62.5\text{m}) = -112.5 \text{ mV} \quad [4]$$

EEEE273 - Quiz 4 [Question Set 3]
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Question:

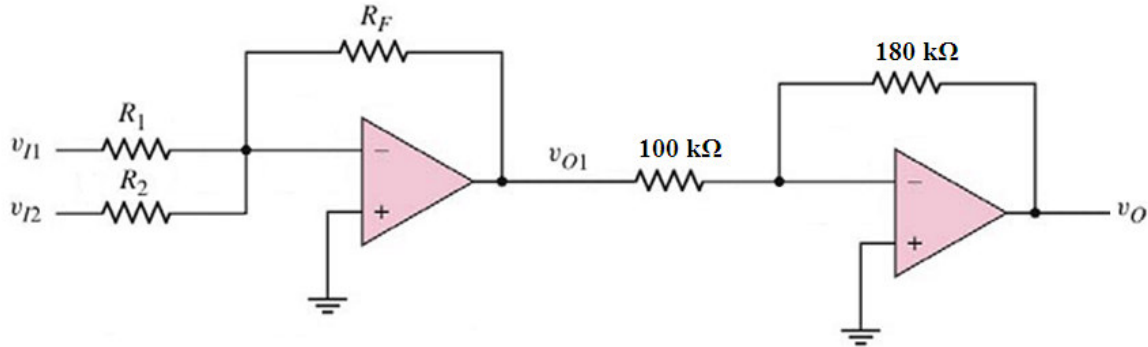


Figure 1

Refer to **Figure 1**. Using ideal properties of the op-amps:

- (e) Determine v_{O1} when $R_1 = 20 \text{ k}\Omega$, $R_2 = 24 \text{ k}\Omega$, $R_F = 30 \text{ k}\Omega$, $v_{I1} = -25 \text{ mV}$, and $v_{I2} = 10 \text{ mV}$. [6 marks]
- (f) Find v_O . [4 marks]

Show clearly all calculations in order to get full marks.

Answers:

(a)

Superposition theorem:

$$v_{I2} = 0, \quad v_{O1}(v_{I1}) = -(R_F / R_1)(v_{I1}) = -(30\text{k}/20\text{k})(-25\text{m}) = 37.5 \text{ mV} \quad [2]$$

$$v_{I1} = 0, \quad v_{O1}(v_{I2}) = -(R_F / R_2)(v_{I2}) = -(30\text{k}/24\text{k})(10\text{m}) = -12.5 \text{ mV} \quad [2]$$

$$v_{O1} = v_{O1}(v_{I1}) + v_{O1}(v_{I2}) = (37.5\text{m}) + (-12.5\text{m}) = 25 \text{ mV} \quad [2]$$

(b)

$$v_O = -(180\text{k}/100\text{k})(v_{O1}) = -(180\text{k}/100\text{k})(25\text{m}) = -45 \text{ mV} \quad [4]$$

Question:

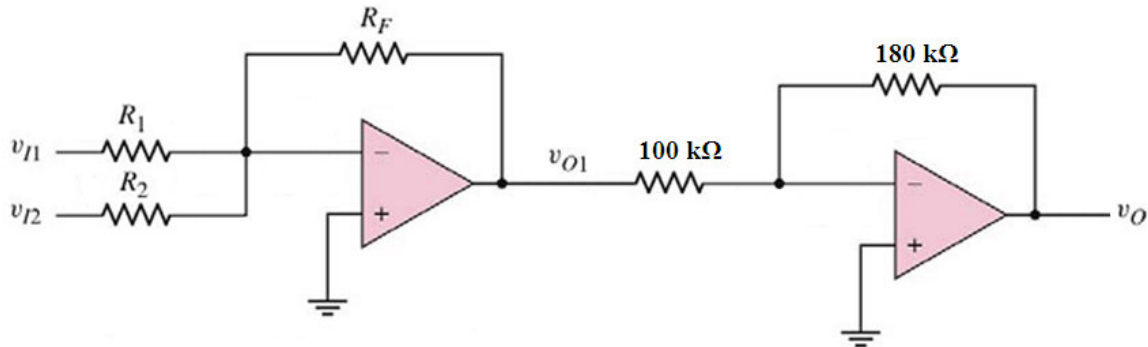


Figure 1

Refer to **Figure 1**. Using ideal properties of the op-amps:

- (g) Determine v_{O1} when $R_1 = 20 \text{ k}\Omega$, $R_2 = 24 \text{ k}\Omega$, $R_F = 30 \text{ k}\Omega$, $v_{I1} = 25 \text{ mV}$, and $v_{I2} = -10 \text{ mV}$. [6 marks]
- (h) Find v_O . [4 marks]

Show clearly all calculations in order to get full marks.

Answers:

(a)

Superposition theorem:

$$v_{I2} = 0, \quad v_{O1}(v_{I1}) = -(R_F / R_1)(v_{I1}) = -(30\text{k}/20\text{k})(25\text{m}) = -37.5 \text{ mV} \quad [2]$$

$$v_{I1} = 0, \quad v_{O1}(v_{I2}) = -(R_F / R_2)(v_{I2}) = -(30\text{k}/24\text{k})(-10\text{m}) = 12.5 \text{ mV} \quad [2]$$

$$v_{O1} = v_{O1}(v_{I1}) + v_{O1}(v_{I2}) = (-37.5\text{m}) + (12.5\text{m}) = -25 \text{ mV} \quad [2]$$

(b)

$$v_O = -(180\text{k}/100\text{k})(v_{O1}) = -(180\text{k}/100\text{k})(-25\text{m}) = 45 \text{ mV} \quad [4]$$