Name:	**Dr JBO**
Student ID Number:	**Model Answer**
Section:	01A / 01B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 4 [Question Set 1]
SEMESTER 1, ACADEMIC YEAR 2012/2013
Date: 28 August 2012

Question:

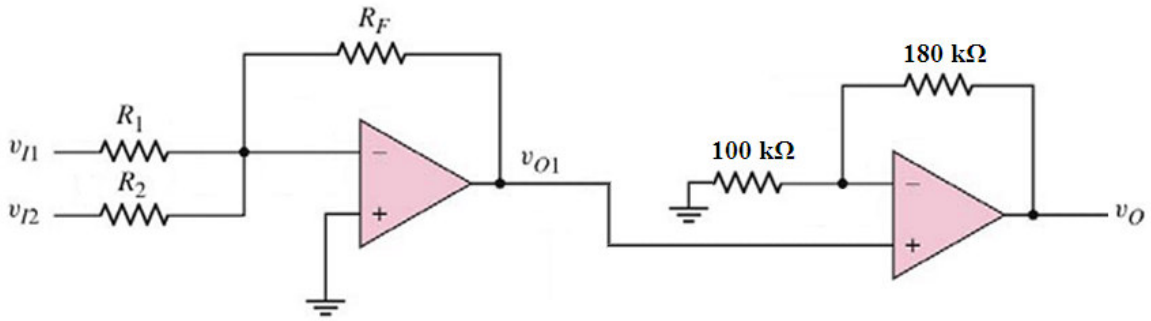

Figure 1

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

(a) Determine v_{O1} when $R_1 = 12$ kΩ, $R_2 = 20$ kΩ, $R_F = 24$ kΩ, $v_{I1} = 15$ mV, and $v_{I2} = -20$ mV. **[6 marks]**

(b) Find v_O. **[4 marks]**

Show clearly all calculations in order to get full marks.

Answers:

(a)
Superposition theorem:

$v_{I2} = 0$, $v_{O1}(v_{I1}) = -(R_F / R_1)(v_{I1}) = -(24k/12k)(15m) = -30$ mV [2]

$v_{I1} = 0$, $v_{O1}(v_{I2}) = -(R_F / R_2)(v_{I2}) = -(24k/20k)(-20m) = 24$ mV [2]

$v_{O1} = v_{O1}(v_{I1}) + v_{O1}(v_{I2}) = (-30m) + (24m) = -6$ mV [2]

(b)

$v_O = (1 + 180k/100k)(v_{O1})$ [2]
$= (1 + 180k/100k)(-6m) = -16.8$ mV [2]

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EEEB273 - Quiz 4 [Question Set 2]
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Date: 28 August 2012

Question:

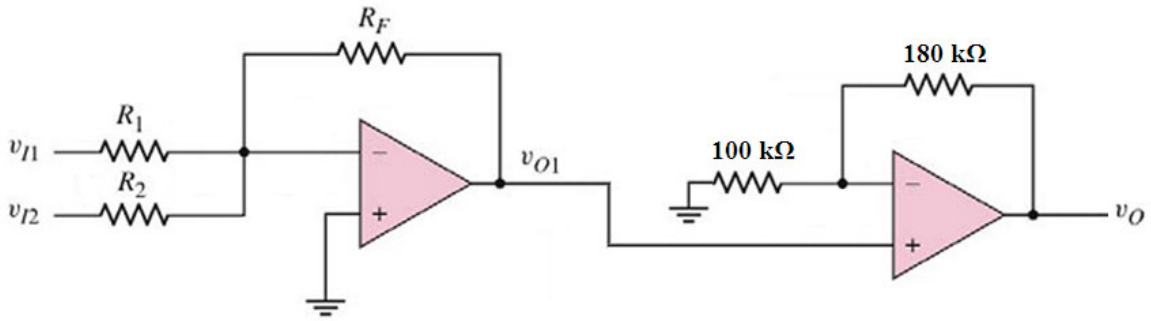

Figure 1

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

(c) Determine v_{O1} when $R_1 = 12$ kΩ, $R_2 = 20$ kΩ, $R_F = 24$ kΩ, $v_{I1} = -15$ mV, and $v_{I2} = 20$ mV. **[6 marks]**

(d) Find v_O. **[4 marks]**

Show clearly all calculations in order to get full marks.

Answers:

(a)
Superposition theorem:

$v_{I2} = 0$, $v_{O1}(v_{I1}) = -(R_F / R_1)(v_{I1}) = -(24k/12k)(-15m) = 30$ mV [2]

$v_{I1} = 0$, $v_{O1}(v_{I2}) = -(R_F / R_2)(v_{I2}) = -(24k/20k)(20m) = -24$ mV [2]

$v_{O1} = v_{O1}(v_{I1}) + v_{O1}(v_{I2}) = (30m) + (-24m) = 6$ mV [2]

(b)

$v_O = (1 + 180k/100k)(v_{O1})$ [2]
$= (1 + 180k/100k)(6m) = 16.8$ mV [2]

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EEEB273 - Quiz 4 [Question Set 3]
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Date: 28 August 2012

Question:

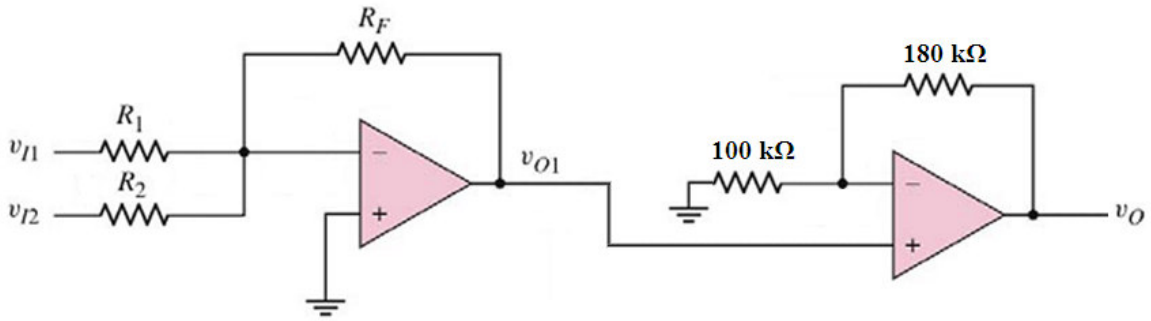

Figure 1

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

(e) Determine v_{O1} when $R_1 = 24\ \text{k}\Omega$, $R_2 = 20\ \text{k}\Omega$, $R_F = 24\ \text{k}\Omega$, $v_{I1} = -15\ \text{mV}$, and $v_{I2} = 20\ \text{mV}$.
[6 marks]

(f) Find v_O.
[4 marks]

Show clearly all calculations in order to get full marks.

Answers:

(a)
Superposition theorem:

$v_{I2} = 0$, $v_{O1}(v_{I1}) = -(R_F / R_1)(v_{I1}) = -(24\text{k}/24\text{k})(-15\text{m}) = 15\ \text{mV}$ **[2]**

$v_{I1} = 0$, $v_{O1}(v_{I2}) = -(R_F / R_2)(v_{I2}) = -(24\text{k}/20\text{k})(20\text{m}) = -24\ \text{mV}$ **[2]**

$v_{O1} = v_{O1}(v_{I1}) + v_{O1}(v_{I2}) = (15\text{m}) + (-24\text{m}) = -9\ \text{mV}$ **[2]**

(b)

$v_O = (1 + 180\text{k}/100\text{k})(v_{O1})$ **[2]**

$= (1 + 180\text{k}/100\text{k})(-9\text{m}) = -25.2\ \text{mV}$ **[2]**

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Date: 28 August 2012

Question:

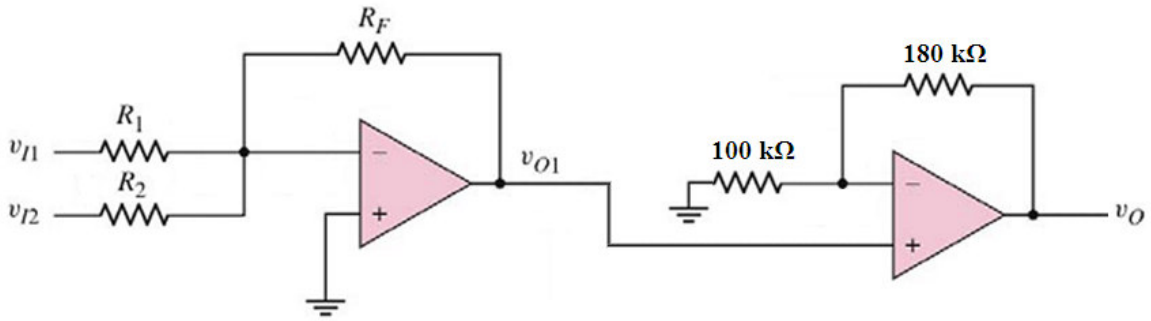

Figure 1

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

(g) Determine v_{O1} when $R_1 = 24\ \text{k}\Omega$, $R_2 = 20\ \text{k}\Omega$, $R_F = 24\ \text{k}\Omega$, $v_{I1} = 15\ \text{mV}$, and $v_{I2} = -20\ \text{mV}$.
[6 marks]

(h) Find v_O.
[4 marks]

Show clearly all calculations in order to get full marks.

Answers:

(a)
Superposition theorem:

$v_{I2} = 0$, $v_{O1}(v_{I1}) = -(R_F / R_1)(v_{I1}) = -(24\text{k}/24\text{k})(15\text{m}) = -15\ \text{mV}$ **[2]**

$v_{I1} = 0$, $v_{O1}(v_{I2}) = -(R_F / R_2)(v_{I2}) = -(24\text{k}/20\text{k})(-20\text{m}) = 24\ \text{mV}$ **[2]**

$v_{O1} = v_{O1}(v_{I1}) + v_{O1}(v_{I2}) = (-15\text{m}) + (24\text{m}) = 9\ \text{mV}$ **[2]**

(b)

$v_O = (1 + 180\text{k}/100\text{k})(v_{O1})$ **[2]**
$= (1 + 180\text{k}/100\text{k})(9\text{m}) = 25.2\ \text{mV}$ **[2]**