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

EEEB273 - Quiz 4
SEMESTER 2, ACADEMIC YEAR 2013/2014
Date: 15 January 2014 Time: 15 minutes

Question:

Refer to Figure 1.

(a) **Show** that the gain for the circuit is given by: **[6 marks]**

$$A_V = \frac{v_O}{v_I} = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right)$$

(b) **Calculate A_v** when R_1 = **50 kΩ**, R_2 = **200 kΩ**, R_3 = **40 kΩ**, and R_4 = **20 kΩ**. **[4 marks]**

Show clearly all calculations in order to get full marks.

(a)

$$v_O = \left(1 + \frac{R_2}{R_1}\right) v_1 \quad [1]$$

$$v_1 = v_2 = \frac{R_4}{R_3 + R_4} v_I = \left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right) v_I \quad [2]$$

$$v_O = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right) v_I \quad [2]$$

$$A_V = \frac{v_O}{v_I} = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right) \quad [1]$$

(b)

$$A_V = \frac{v_O}{v_I} = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right) \quad [1]$$

$$A_V = \left(1 + \frac{200k}{50k}\right)\left(\frac{20k / 40k}{1 + 20k / 40k}\right) = 1.67 \text{ V/V} \quad [2,1]$$

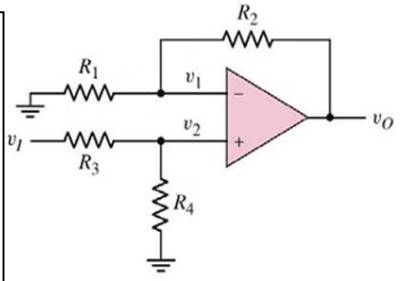

Figure 1

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Question:

Refer to Figure 1.

(c) **Show** that the output for the circuit is given by: **[6 marks]**

$$v_O = \left(1+\frac{R_2}{R_1}\right)\left(\frac{R_4/R_3}{1+R_4/R_3}\right)v_I$$

(d) **Calculate v_O** when R_1 = **50 kΩ**, R_2 = **200 kΩ**, R_3 = **20 kΩ**, R_4 = **40 kΩ**, and v_I = **0.01 V**. **[4 marks]**

Show clearly all calculations in order to get full marks.

(a)

$$v_O = \left(1+\frac{R_2}{R_1}\right)v_1 \quad [1]$$

$$v_1 = v_2 = \frac{R_4}{R_3+R_4}v_I = \left(\frac{R_4/R_3}{1+R_4/R_3}\right)v_I \quad [1,2]$$

$$v_O = \left(1+\frac{R_2}{R_1}\right)\left(\frac{R_4/R_3}{1+R_4/R_3}\right)v_I \quad [2]$$

(b)

$$v_O = \left(1+\frac{R_2}{R_1}\right)\left(\frac{R_4/R_3}{1+R_4/R_3}\right)v_I \quad [1]$$

$$v_O = \left(1+\frac{200k}{50k}\right)\left(\frac{40k/20k}{1+40k/20k}\right)0.01 = 0.033\ \text{V} \quad [2,1]$$

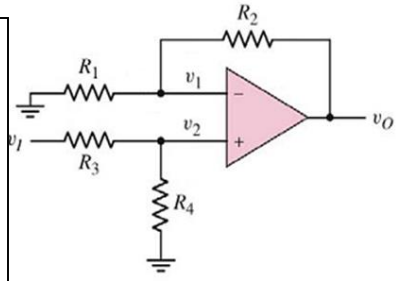

Figure 1

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Question:

Refer to Figure 1.

(e) **Show** that the gain for the circuit is given by: **[6 marks]**

$$A_V = \frac{v_O}{v_I} = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right)$$

(f) **Calculate v_O** when R_1 = **50 kΩ**, R_2 = **200 kΩ**, R_3 = **40 kΩ**, R_4 = **20 kΩ**, and v_I = **-0.05 V**. **[4 marks]**

Show clearly all calculations in order to get full marks.

(a)

$$v_O = \left(1 + \frac{R_2}{R_1}\right) v_1 \quad [1]$$

$$v_1 = v_2 = \frac{R_4}{R_3 + R_4} v_I = \left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right) v_I \quad [2]$$

$$v_O = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right) v_I \quad [2]$$

$$A_V = \frac{v_O}{v_I} = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right) \quad [1]$$

(b)

$$v_O = \left(1 + \frac{R_2}{R_1}\right)\left(\frac{R_4 / R_3}{1 + R_4 / R_3}\right) v_I \quad [1]$$

$$v_O = \left(1 + \frac{200k}{50k}\right)\left(\frac{20k / 40k}{1 + 20k / 40k}\right)(-0.05) = -0.083\,\text{V} \quad [2,1]$$

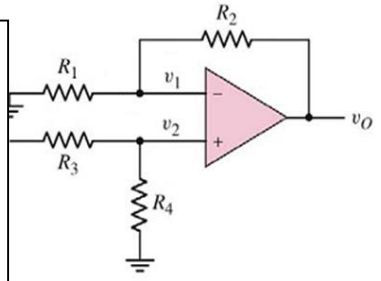

Figure 1

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Question:

Refer to Figure 1.

(g) **Show** that the output for the circuit is given by: **[6 marks]**

$$v_O = \left(1+\frac{R_2}{R_1}\right)\left(\frac{R_4/R_3}{1+R_4/R_3}\right)v_I$$

(h) **Calculate v_I** when R_1 = **50 kΩ**, R_2 = **200 kΩ**, R_3 = **40 kΩ**, R_4 = **20 kΩ**, and v_O = **-2.35 V**. **[4 marks]**

Show clearly all calculations in order to get full marks.

(a)

$$v_O = \left(1+\frac{R_2}{R_1}\right)v_1 \quad [1]$$

$$v_1 = v_2 = \frac{R_4}{R_3+R_4}v_I = \left(\frac{R_4/R_3}{1+R_4/R_3}\right)v_I \quad [1,2]$$

$$v_O = \left(1+\frac{R_2}{R_1}\right)\left(\frac{R_4/R_3}{1+R_4/R_3}\right)v_I \quad [2]$$

(b)

$$v_I = v_O \Big/ \left(\left(1+\frac{R_2}{R_1}\right)\left(\frac{R_4/R_3}{1+R_4/R_3}\right)\right) \quad [1]$$

$$v_I = (-2.35) \Big/ \left(\left(1+\frac{200k}{50k}\right)\left(\frac{20k/40k}{1+20k/40k}\right)\right) = -1.41\,\text{V} \quad [2,1]$$

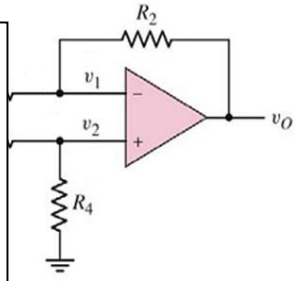

Figure 1