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

EEEB273 - Quiz 4 T
SEMESTER 1, ACADEMIC YEAR 2013/2014
Date: 2 September 2013 Time: 15 minutes

Question:

Refer to Figure 1.

(a) **Derive** the relationship (formula) between v_I and v_O in terms of R_1 and R_2. **[6 marks]**

(b) **Calculate v_O** when R_1 = **50 kΩ**, R_2 = **200 kΩ** and v_I = **0.5 V**. **[4 marks]**

Show clearly all calculations in order to get full marks.

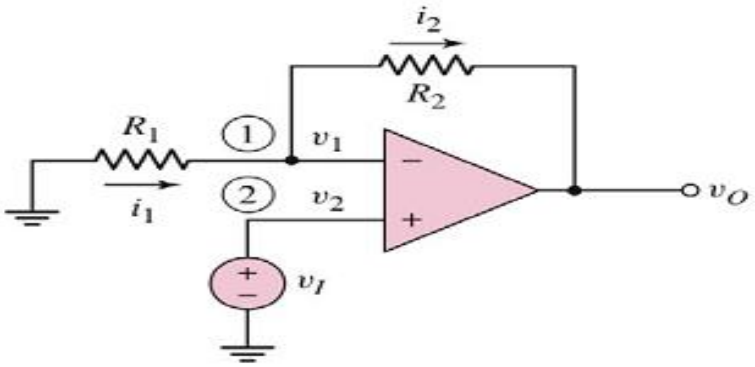

Figure 1

Answer:

(a)

$v_1 \cong v_2 = v_I$	[1]
$i_1 = (0 - v_1) / R_1 = -v_I / R_1$	[2]
$i_I = i_2$	[0.5]
$v_O = v_1 - i_2 R_2 = v_I - (-v_I / R_1) R_2$	[2]
$v_O = (1 + R_2 / R_1) v_I$	[0.5]

(b)

$v_O = (1 + R_2 / R_1) v_I$	[2]
$= (1 + 200k / 50k)(0.5V) = 2.5$ V	[2]

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Question:

Refer to Figure 1.

(c) **Derive** the relationship (formula) between v_I and v_O in terms of R_1 and R_2. **[6 marks]**

(d) **Calculate v_I** when R_1 = **50 kΩ**, R_2 = **180 kΩ** and v_O = **2.5 V**. **[4 marks]**

Show clearly all calculations in order to get full marks.

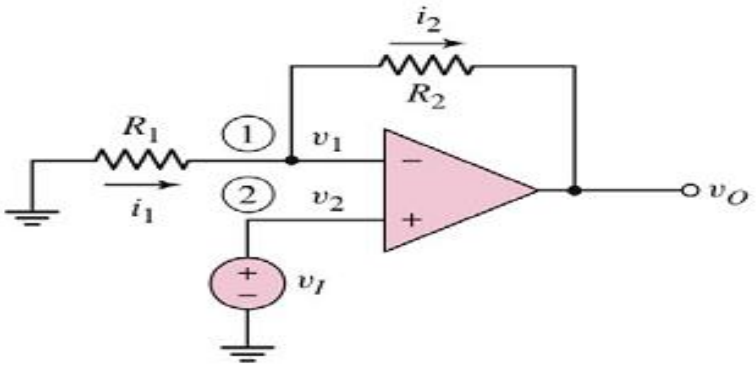

Figure 1

Answer:

(a)

$v_1 \cong v_2 = v_I$	[1]
$i_1 = (0 - v_1) / R_1 = -v_I / R_1$	[2]
$i_I = i_2$	[0.5]
$v_O = v_1 - i_2 R_2 = v_I - (-v_I / R_1) R_2$	[2]
$v_O = (1 + R_2 / R_1) v_I$	[0.5]

(b)

$v_I = v_O / (1 + R_2 / R_1)$	[2]
$= 2.5\text{V} / (1 + 180\text{k} / 50\text{k}) = 0.54347\ \text{V}$	[2]

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Question:

Refer to Figure 1.

(e) **Derive** the relationship (formula) between v_I and v_O in terms of R_1 and R_2. **[6 marks]**

(f) **Calculate R_1** when R_2 = **150 kΩ**, v_I = **+0.5 V** and v_O = **2.5 V**. **[4 marks]**

Show clearly all calculations in order to get full marks.

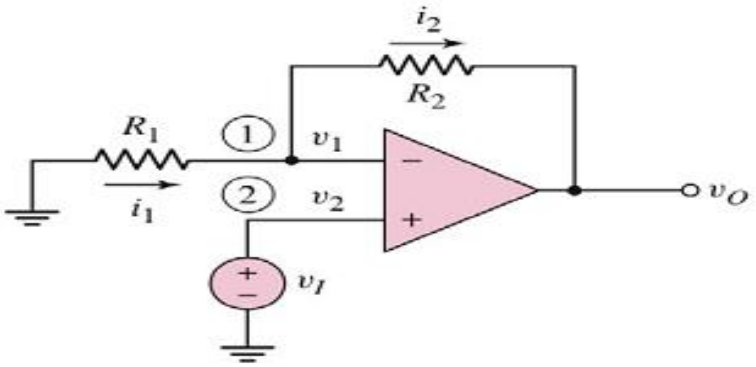

Figure 1

Answer:

(a)

$v_1 \cong v_2 = v_I$	[1]
$i_1 = (0 - v_1) / R_1 = -v_I / R_1$	[2]
$i_I = i_2$	[0.5]
$v_O = v_1 - i_2 R_2 = v_I - (-v_I / R_1) R_2$	[2]
$v_O = (1 + R_2 / R_1) v_I$	[0.5]

(b)

$R_1 = R_2 / (v_O/v_I - 1)$	[2]
$= 150k / (2.5/0.5 - 1) = 37.5$ kΩ	[2]

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Question:

Refer to Figure 1.

(g) **Derive** the relationship (formula) between v_I and v_O in terms of R_1 and R_2. **[6 marks]**

(h) **Calculate R_2** when R_1 = **50 kΩ**, v_I = **+0.6 V** and v_O = **3.8 V**. **[4 marks]**

Show clearly all calculations in order to get full marks.

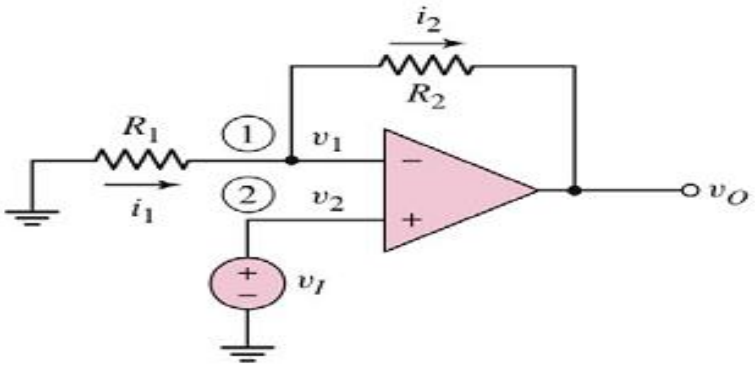

Figure 1

Answer:

(a)

$v_1 \cong v_2 = v_I$	[1]
$i_1 = (0 - v_1) / R_1 = -v_I / R_1$	[2]
$i_I = i_2$	[0.5]
$v_O = v_1 - i_2 R_2 = v_I - (-v_I / R_1) R_2$	[2]
$v_O = (1 + R_2 / R_1) v_I$	[0.5]

(b)

$R_2 = R_1 (v_O/v_I - 1)$	[2]
$= 50\text{k} (3.8/0.6 - 1) = 266.667\ \text{k}\Omega$	[2]