

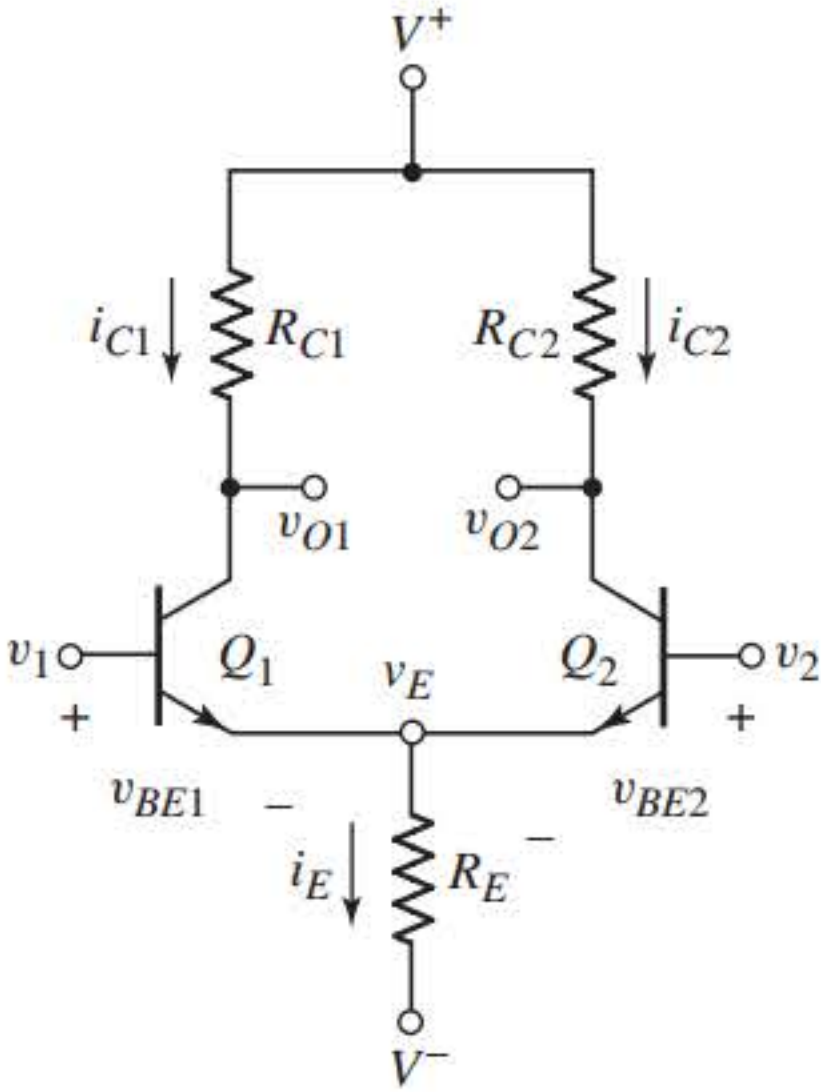
Homework 5.1

Homework due Aug 16, 2022 23:59 +06 Completed

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HW 5.1.1

4.0/4.0 points (graded)



In the above circuit use this following information.

The cutin or threshold voltage of the transistors  $V_{BE}(cutin) = 0.5V$ .

In saturation, transistors have  $V_{BE} = 0.8V$  and  $V_{CE} = 0.1V$ .

In forward active mode, transistors have  $V_{BE}(ON) = 0.7V$ .

The forward common emitter current gain of the transistors  $\beta_F$  is very high. Therefore, you can ignore the base current.

Assume that  $V^+ = 1.8V$ ,  $V^- = -1.8V$ ,  $R_{C1} = R_{C2} \equiv R_C = 5k\Omega$ ,  $R_E = 6k\Omega$ , and  $v_2 = 0$ . Neglect base currents in the dc analysis.

Now assume  $v_1 = 0V$ .

Find the value of  $i_E$  in  $mA$ .

0.18333



Find the value of  $i_{C1}$  in  $mA$ .

0.091667



Find the value of  $i_{C2}$  in  $mA$ .

0.091667



Find the value of  $v_{O1}$  in  $V$ .

1.34167



Find the value of  $v_{O2}$  in  $V$ .

1.34167



Save Show answer

Submit

You have used 1 of 4 attempts

HW 5.1.2

3.0/3.0 points (graded)

Now assume  $v_1 = -0.5V$ .

Find the value of  $i_E$  in  $mA$ .

0.18333



Find the value of  $i_{C1}$  in  $mA$ .

0



Find the value of  $i_{C2}$  in  $mA$ .

0.18333



Find the value of  $v_{O1}$  in  $V$ .

1.8



Find the value of  $v_{O2}$  in  $V$ .

0.8835



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HW 5.1.3

3.0/3.0 points (graded)

Now assume  $v_1 = +0.5V$ .

Find the value of  $i_E$  in  $mA$ .

0.2667



Find the value of  $i_{C1}$  in  $mA$ .

0.2667



Find the value of  $i_{C2}$  in  $mA$ .

0



Find the value of  $v_{O1}$  in  $V$ .

0.4665



Find the value of  $v_{O2}$  in  $V$ .

1.8





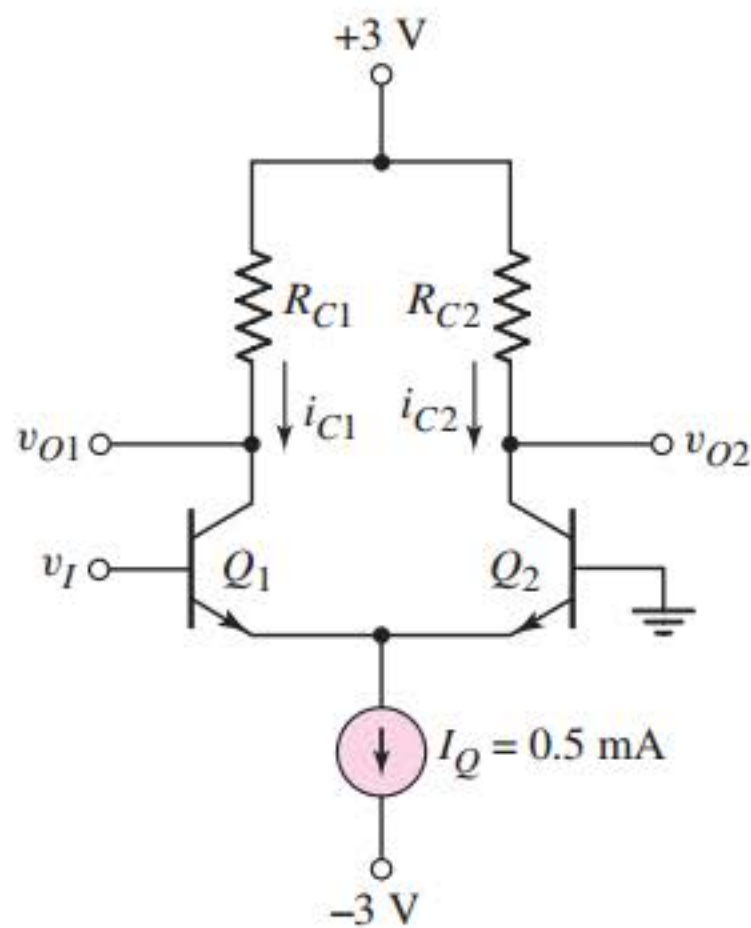
## Homework 5.2

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### HW 5.2.1

6.0/6.0 points (graded)



In the above circuit use this following information.

The cutin or threshold voltage of the transistors  $V_{BE}(\text{cutin}) = 0.5V$ .

In saturation, transistors have  $V_{BE} = 0.8V$  and  $V_{CE} = 0.1V$ .

In forward active mode, transistors have  $V_{BE}(\text{ON}) = 0.7V$ .

The forward common emitter current gain of the transistors  $\beta_F$  is very high. Therefore, you can ignore the base current.

Determine the value of  $R_{C2}$  in  $k\Omega$  such that the minimum value of  $v_{O2} = -1V$ .



8

Determine the value of  $R_{C1}$  in  $k\Omega$  such that the minimum value of  $v_{O1} = 0V$  when  $v_I = 1V$ .



6

Determine the value of  $v_I$  in  $mV$  so  $i_{C2} = 0.30mA$  and  $i_{C1} = 0.20mA$ . Hint: Use the exponential relationship of base emitter voltage with the emitter current.



-10.50154

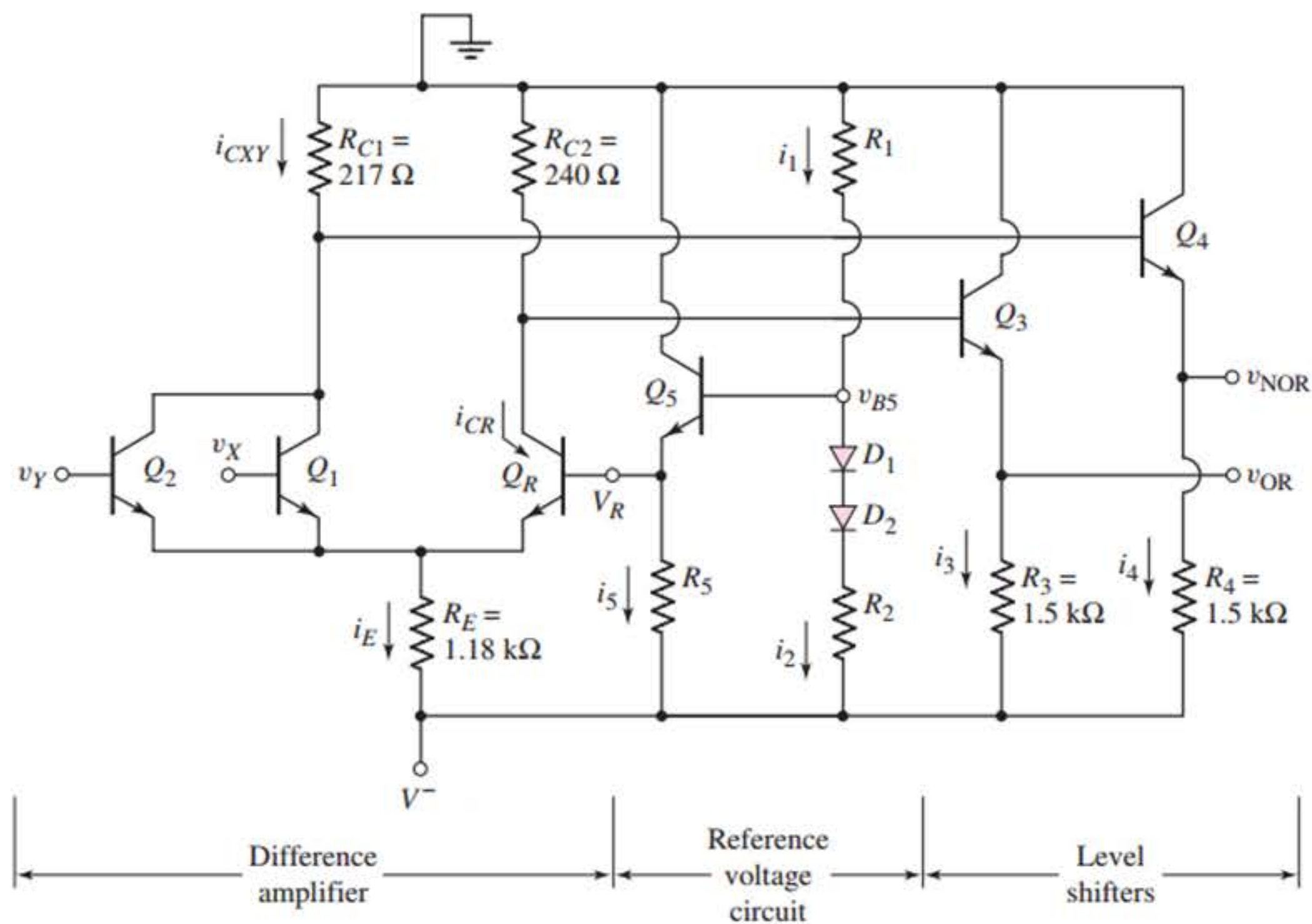
## Homework 5.3

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### HW 5.3.1

6.0/6.0 points (graded)



In the above circuit use this following information.

The cutin or threshold voltage of the transistors  $V_{BE}(\text{cutin}) = 0.5V$ .

In saturation, transistors have  $V_{BE} = 0.8V$  and  $V_{CE} = 0.1V$ .

In forward active mode, transistors have  $V_{BE}(\text{ON}) = 0.7V$ .

The forward common emitter current gain of the transistors  $\beta_F$  is very high. Therefore, you can ignore the base current.

Let  $V^- = -3.3V$ . The reference voltage is to be  $V_R = -1.0V$  and the currents are to

be  $i_1 = i_2 = i_5 = 0.5mA$ .

Find the value of  $R_1$  in  $k\Omega$ .



0.6

Find the value of  $R_2$  in  $k\Omega$ .



3.2

Find the value of  $R_5$  in  $k\Omega$ .



4.6



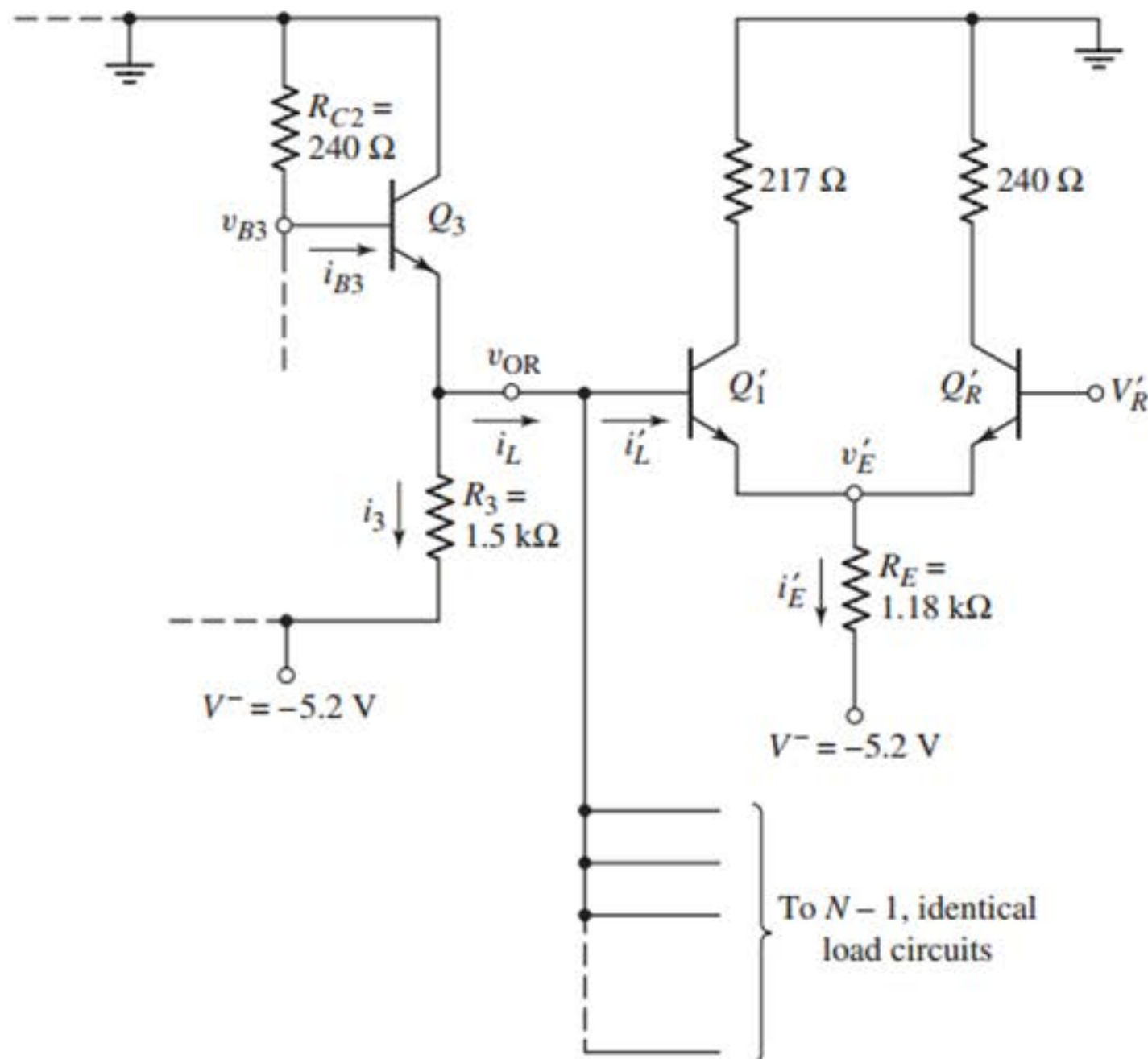
## Homework 5.4

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### HW 5.4.1

6.0/6.0 points (graded)



In the above circuit use this following information.

The cutin or threshold voltage of the transistors  $V_{BE}(\text{cutin}) = 0.5\text{V}$ .

In saturation, transistors have  $V_{BE} = 0.8\text{V}$  and  $V_{CE} = 0.1\text{V}$ .

In forward active mode, transistors have  $V_{BE}(\text{ON}) = 0.7\text{V}$ .

The forward common emitter current gain of the transistors  $\beta_F = 50$ .

**Do not ignore the base current. Write the answer upto 5 decimal points.**

If the fanout for the situation described in the figure is limited to  $N = 35$ , find the new value of  $v_{OR}$  in  $\text{V}$ .

-0.72437



-0.72437



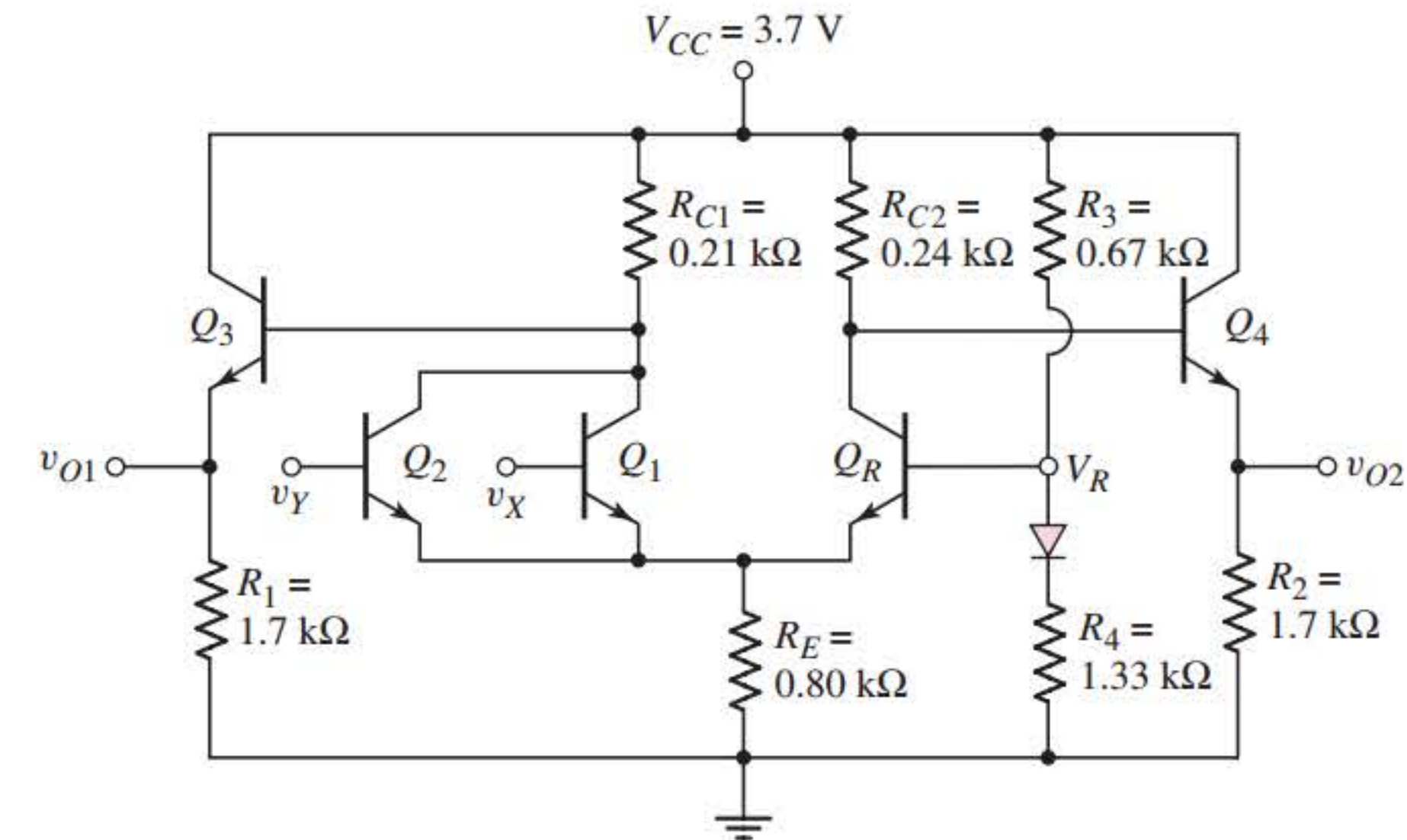
Homework 5.5

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HW 5.5.1

4.0/4.0 points (graded)



In the above circuit use this following information.

The cutin or threshold voltage of the transistors  $V_{BE} (cutin) = 0.5V$ .

In saturation, transistors have  $V_{BE} = 0.8V$  and  $V_{CE} = 0.1V$ .

In forward active mode, transistors have  $V_{BE} (ON) = 0.7V$ .

The forward common emitter current gain of the transistors  $\beta_F$  is very high. Therefore, you can ignore the base current.

Find the value of  $i_{R_3}$  that in current through  $R_3$  resistor in  $mA$ .

✓

1.5

Find the value of  $V_R$  in  $V$ .

✓

2.695

Save Show answer

Submit You have used 1 of 4 attempts

HW 5.5.2

8.0/8.0 points (graded)

Assume  $v_x = v_y = \text{Logic 1}$ .

What is the Logic 1 value of  $v_{O2}$  in  $V$ ?

✓

3

What is the Logic 1 value of  $v_x$  in  $V$ ?

✓

3

What is the Logic 1 value of  $v_y$  in  $V$ ?

✓

3

Find the current  $i_{R_E}$  in  $mA$ .

✓

2.875

Find the current  $i_{R_{C1}}$  in  $mA$ .

✓

2.875

Find the voltage  $V_{B3}$  in  $V$ .

✓

3.09625

What is the Logic 0 value of  $v_{O1}$  in  $V$ ?

✓

2.396

Find the power dissipation in  $mW$ . Ignore all base currents.

✓

27.932

Save Show answer

Submit You have used 2 of 6 attempts

HW 5.5.3

8.0/8.0 points (graded)

Assume  $v_x = v_y = \text{Logic 0}$ .

What is the Logic 1 value of  $v_{O1}$  in  $V$ ?

✓

3

What is the Logic 0 value of  $v_x$  in  $V$ ?

✓

2.396

What is the Logic 0 value of  $v_y$  in  $V$ ?

✓

2.396

Find the current  $i_{R_E}$  in  $mA$ .

✓

2.49375

Find the current  $i_{R_{C1}}$  in  $mA$ .

✓

0

Find the current  $i_{R_{C2}}$  in  $mA$ .

✓

2.49375

Find the voltage  $V_{B4}$  in  $V$ .

✓

3.1015

What is the Logic 0 value of  $v_{O2}$  in  $V$ ?

✓

2.4015

Find the power dissipation in  $mW$ . Ignore all base currents.

✓

26.5529

Save Show answer