Homework 4.1

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

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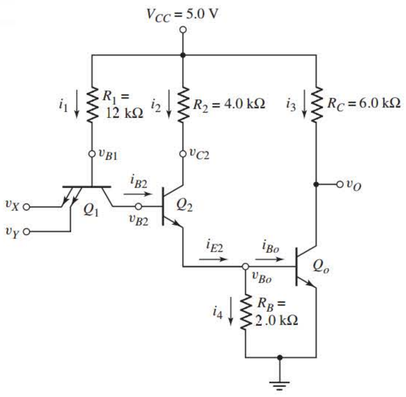
HW 4.1.1

2.0/2.0 points (graded)



In the above circuit use this following information.

The cutin voltage of diodes $V_\gamma\,(diode) = 0.6V$.

The conducting voltage of diode is = $0.7V$

The cutin voltage of the transistors $V_\gamma\,(transistor) = 0.5V$.

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

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

The forward common emitter current gain of the transistors $\beta_F = 25$.

The reverse common emitter current gain of the transistors $\beta_R = 0.1$.

Assume any of the input is low that means any of the input is $0.1V$.

For this part assume inputs of the load devices are not connected to driver device.

Find i_1 in mA.

0.342 ✔

0.342

Find i_{B2} in mA.

0 ✔

0

Find i_2 in mA.

0 ✔

0

Find i_{Bo} in mA.

0 ✔

0

Find i_3 in mA.

0 ✔

0

Save | Show answer

Submit You have used 2 of 5 attempts

HW 4.1.2

5.0/5.0 points (graded)

Assume all the inputs is high that means any of the input is $V_x = V_y = 5V$.

For this part assume inputs of the load devices are not connected to driver device.

Find i_1 in mA.

0.225 ✔

0.225

Find i_{B2} in mA.

0.27 ✔

0.27

Find i_2 in mA.

1.025 ✔

1.025

Find i_{Bo} in mA.

0.895 ✔

0.895

Find i_3 in mA.

0.8167 ✔

0.8167

Save | Show answer

Submit You have used 1 of 5 attempts

HW 4.1.3

3.0/3.0 points (graded)

Find out the FANOUT of the TTL circuit.
Use floor function to find the answer.

63 ✔

63

Save | Show answer

Submit You have used 1 of 4 attempts

Homework 4.2

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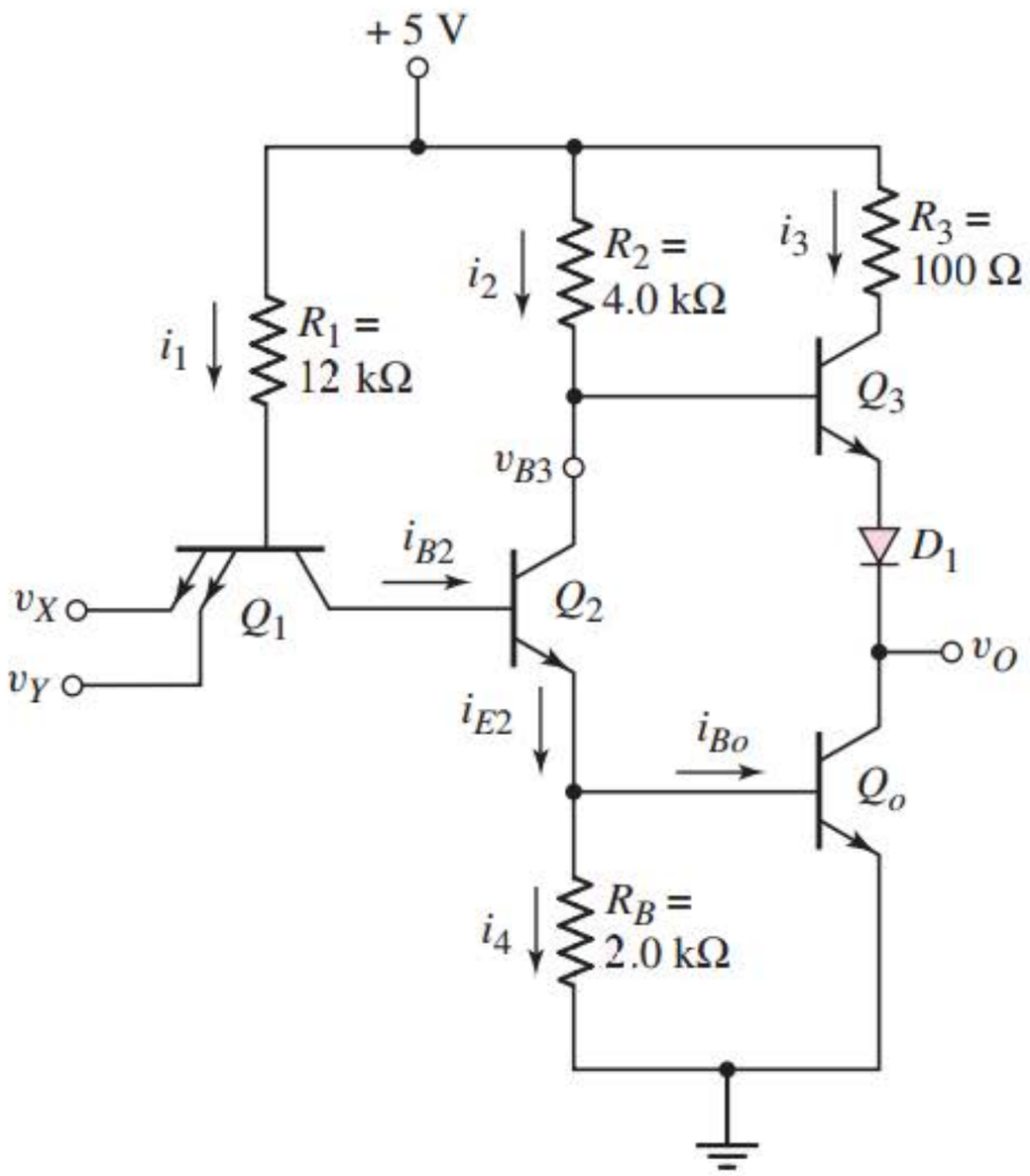
HW 4.2.1

5.0/5.0 points (graded)



In the above circuit use this following information.

The cutin voltage of diodes $V_\gamma\,(diode) = 0.6V$.

The conducting voltage of diode is = $0.7V$

The cutin voltage of the transistors $V_\gamma\,(transistor) = 0.5V$.

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

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

The forward common emitter current gain of the transistors $\beta_F = 25$.

The reverse common emitter current gain of the transistors $\beta_R = 0.1$.

Assume any of the input is low that means any of the input is $0.1V$.

For this part assume inputs of the load devices are not connected to driver device. Assume that steady state has arraived.

Find the minimum value for β_F for Q_2, so that Q_2 can remain in saturation when both input is HIGH.

3.79 ✔

3.79

Save | Show answer

Homework 4.3

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

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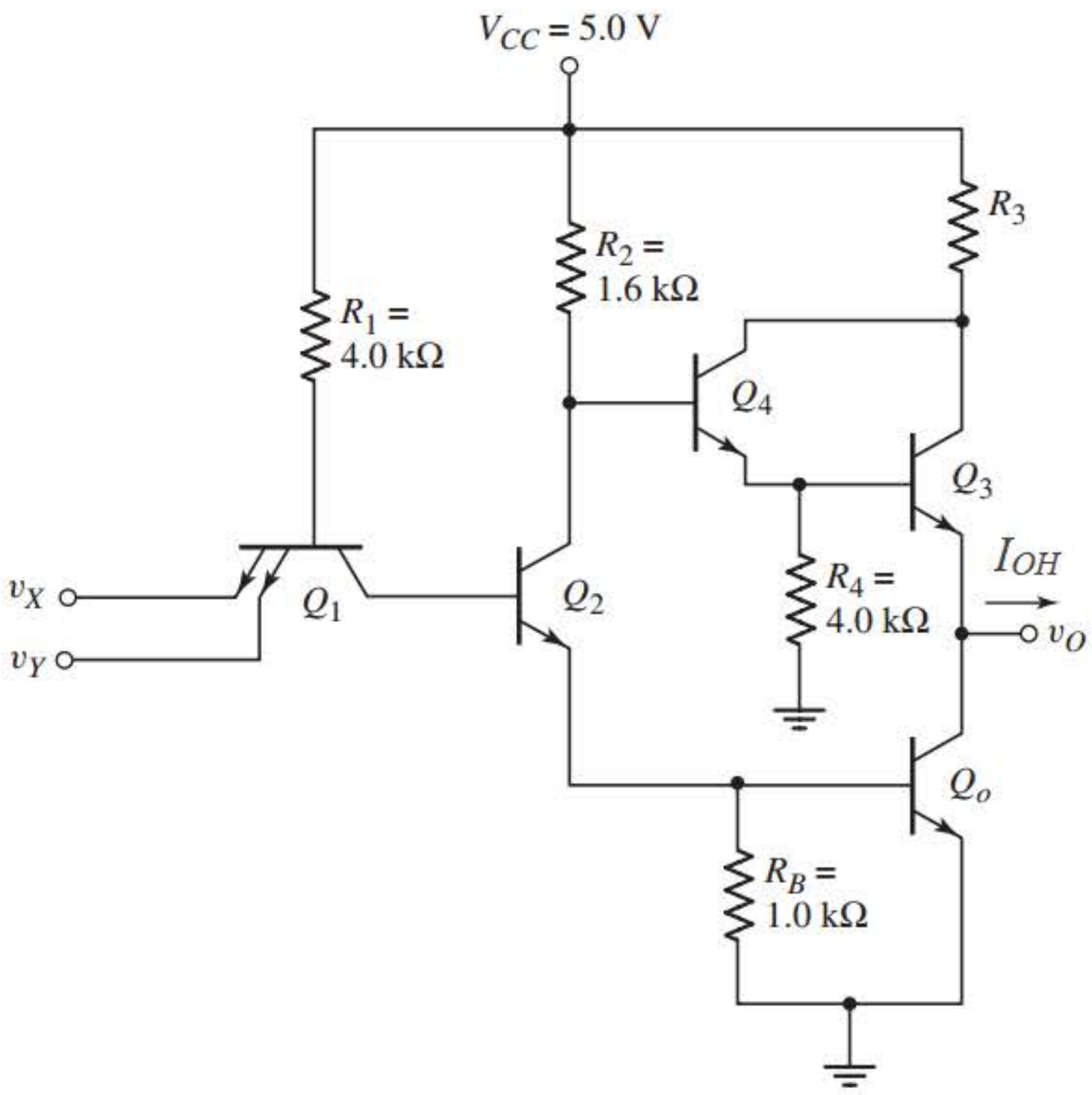
HW 4.3.1

5.0/5.0 points (graded)



In the above circuit use this following information.

The cutin voltage of diodes $V_\gamma\,(diode) = 0.6V$.

The conducting voltage of diode is = $0.7V$

The cutin voltage of the transistors $V_\gamma\,(transistor) = 0.5V$.

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

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

The forward common emitter current gain of the transistors $\beta_F = 24$.

The reverse common emitter current gain of the transistors $\beta_R = 0.1$.

Assume any of the input is low that means any of the input is $0.1V$.

Current flowing into an output in the logical "1" state under specified load conditions $I_{OH} = 0.4mA$.

For this part assume inputs of the load devices are not connected to driver device. Assume that steady state has arraived.

If anyone manages to solve this problem by doing theoretical calculation and find a formula, then s/he may be rewarded bonus marks worth of a total quiz.

Without any particular inequality formula the answer would not be accepted. The solution isn't a single value but several values. You need to determine the range of values.

However, you can answer this checkbox without calculating any thing. It is almost like an IQ test problem if you think carefully.

You can submit your calculation in a pdf file and send it to $shahnewaz.ahmed@bracu.ac.bd$. You need to perform your analysis for both input cases.

First 10 persons will get full marks if the analysis is correct and complete. No partial mark would be awarded for incomplete analysis. This offer will remain open till the final exam. But you need submit this checkbox problem within deadline though.

What should be the acceptable value range(s) for R_3 so that Q_4 never goes to satuaration mode?

- [x] $< 200\Omega$
- [x] $< 400\Omega$
- [ ] $< 800\Omega$
- [ ] $< 1600\Omega$

Save | Show answer

Homework 4.4

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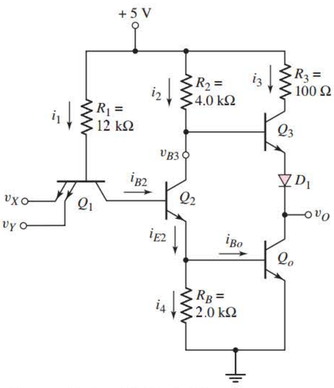
HW 4.4.1

2.0/2.0 points (graded)



In the above circuit use this following information.

The cutin voltage of diodes $V_\gamma\,(diode) = 0.6V$.

The conducting voltage of diode is = $0.7V$

The cutin voltage of the transistors $V_\gamma\,(transistor) = 0.5V$.

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

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

The forward common emitter current gain of the transistors $\beta_F = 25$.

The reverse common emitter current gain of the transistors $\beta_R = 0.1$.

Assume any of the input is low that means any of the input is $0.1V$.

For this part assume inputs of the load devices are not connected to driver device. Assume that steady state has arraived.

Find i_1 in mA.

0.342 ✔

0.342

Find i_{B2} in mA.

0 ✔

0

Find i_2 in mA.

0 ✔

0

Find i_{Bo} in mA.

0 ✔

0

Find i_3 in mA.

0 ✔

0

Save | Show answer

Submit You have used 1 of 3 attempts

HW 4.4.2

5.0/5.0 points (graded)

Assume all the inputs is high that means any of the input is $V_x = V_y = 3.6V$.

For this part assume inputs of the load devices are not connected to driver device. Assume that steady state has arrived.

Find i_1 in mA.

0.225 ✔

0.225

Find i_{B2} in mA.

0.27 ✔

0.27

Find i_2 in mA.

1.025 ✔

1.025

Find i_{Bo} in mA.

0.895 ✔

0.895

Find i_3 in mA.

0 ✔

0

Save | Show answer

Submit You have used 1 of 6 attempts

HW 4.4.3

3.0/3.0 points (graded)

Find out the FANOUT of the TTL circuit. (Use floor function to find the answer.)

65 ✔

65

Find out the maximum power dissipation of the TTL circuit in mW.

6.25 ✔

6.25

Save | Show answer

Homework 4.5

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

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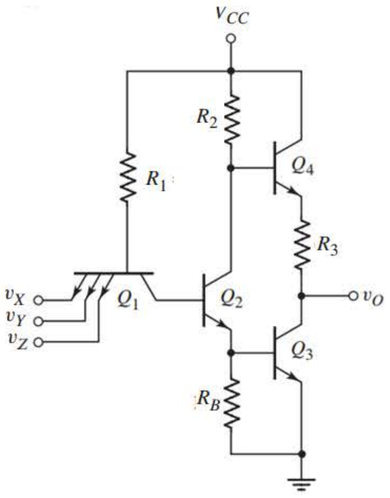
HW 4.5.1

25/25 points (graded)



In the above circuit use this following information. In saturation, transistors have $V_{BE}\,(SAT) = 0.8V$ and $V_{CE}\,(SAT) = 0.1V$. In forward active mode, transistors have $V_{BE}\,(ACTIVE) = 0.7V$. In reverse active mode, transistors have $V_{BC}\,(R, ACTIVE) = 0.7V$. The common emitter current gain of the transistors $\beta_F = 15.0$. The reverse active current gain of the transistors is $\beta_R = 0.8$ (for each emitter).

Also $V_{CC} = 3.2V$, $R_1 = 4.0k\Omega$, $R_2 = 1.1k\Omega$, $R_3 = 0.5k\Omega$ and $R_B = 10k\Omega$. Assume all the inputs are connected to the V_{CC} and no load is connected to circuit.

What is the operating mode of Q_4 transistor for this case? Submit 1 for cutoff, 2 for saturation, 3 for forward active and 4 for reverse active.

3 ✔

3

What is the operating mode of Q_1 transistor for this case? Submit 1 for cutoff, 2 for saturation, 3 for forward active and 4 for reverse active.

4 ✔

4

Find the value of the base current of Q_1 tansistor i_{B1} in mA.

0.225 ✔

0.225

Find the value of the base current of Q_2 tansistor i_{B2} in mA.

0.765 ✔

0.765

Find the value of the base current of Q_3 tansistor i_{B3} in mA.

2.8434 ✔

2.8434

Find the value of the base current of Q_4 tansistor i_{B4} in μA.

12.5 ✔

12.5

Find the value of the emitter current of Q_3 tansistor i_{E3} in mA.

2.8434+0.2 ✔

$2.8434 + 0.2$

Find the value of the power dissipation in mW.

3.2*3.0434 ✔

$3.2 \cdot 3.0434$

Now assume load is connected to the circuit. Find the maximum fanout for this circuit.

73 ✔

73

If all the inputs are connected to $0.1V$ and 12 fanouts are connected to the output port, find the new value of v_0.

1.2715 ✔

1.2715