Homework 3.1

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HW 3.1.1

3.0/3.0 points (graded)

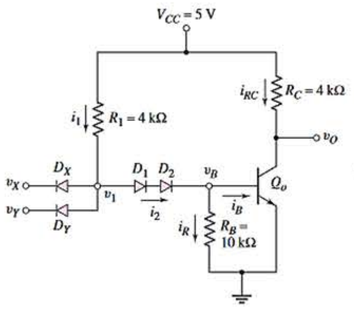

Table Piecewise linear parameters for a pn junction diode and npn bipolar transistor

Parameter	Value
V_γ	0.7 V
V_{BE}(on)	0.7 V
V_{BE}(sat)	0.8 V
V_{CE}(sat)	0.1 V

Consider the DTL circuit in the above figure. Assume the transistor parameters areas given in Table and let $\beta = 25$. In the picture V_γ represents the cutin voltage of diodes.

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

Find i_1 in mA.

1.05 ✔

1.05

Find i_2 in mA.

0 ✔

0

Find i_R in mA.

0 ✔

0

Find i_B in mA.

0 ✔

0

Find i_{RC} in mA.

0 ✔

0

Save | Show answer

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HW 3.1.2

7.0/7.0 points (graded)

Now assume that both inputs are high or $v_X = v_Y = 5V$.

Find i_1 in mA.

0.7 ✔

0.7

Find i_2 in mA.

0.7 ✔

0.7

Find i_{RC} in mA.

1.225 ✔

1.225

Find i_R in mA.

0.08 ✔

0.08

Find i_B in mA.

0.62 ✔

0.62

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Homework 3.2

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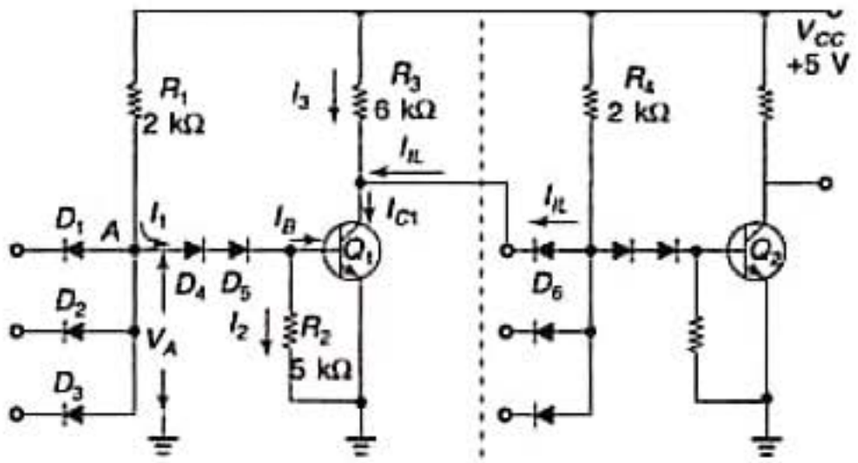
HW 3.2.1

5.0/5.0 points (graded)



In this circuit use the 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 $V_{CE} = 0.1V$.

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

Here assume the output port is connected to the input of a similar device.

Determine the FANOUT of this DTL NAND gate.
Use floor function for the answer.

14 ✔

14

Save | Show answer

Homework 3.3

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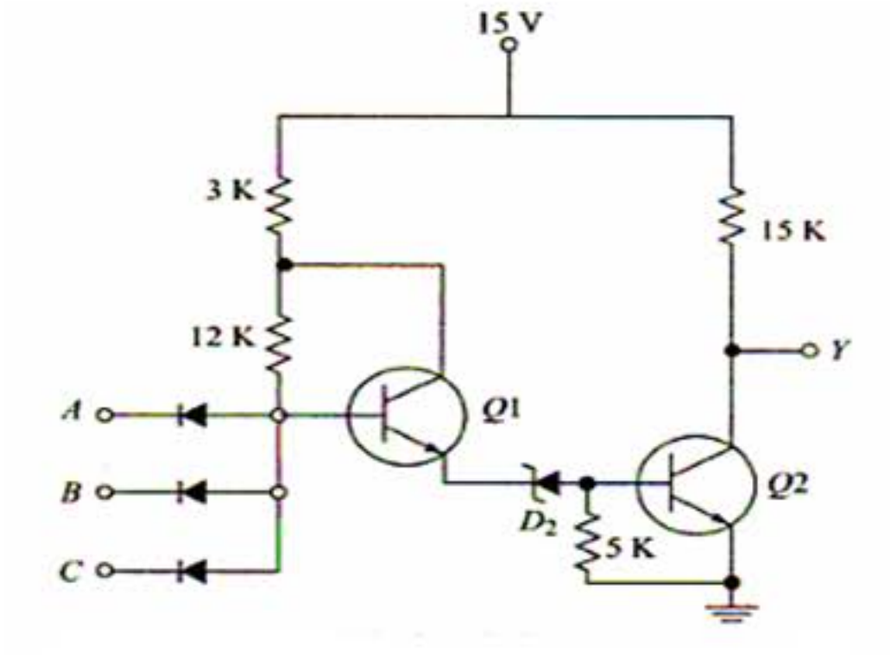
HW 3.3.1

5.0/5.0 points (graded)



In this circuit use the following information.

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

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 common emitter current gain of the transistors $\beta = 25$.

The reverse breakdown voltage of Zener diode is $V_{ZN} = 8V$.

If all the inputs are high ($V_A = V_B = V_C = 15V$), what is the magnitude of the noise voltage in V at the input which will cause the gate to malfunction?

6.1 ✔

6.1

If one input is low ($0.1V$), what is the magnitude of the noise voltage in V at that input terminal which will cause the gate to malfunction?

8.2 ✔

8.2

Save | Show answer

Homework 3.4

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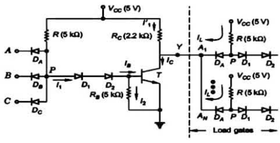
HW 3.4.1

3.0/3.0 points (graded)



In the above circuit use the following information.

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

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 common emitter current gain of the transistors $\beta = 30$.

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_L in mA. Calculate I_L for driver device.

0.85 ✔

0.85

Find I_1 in mA.

0 ✔

0

Find I_2 in mA.

0 ✔

0

Find I_B in mA.

0 ✔

0

Find I_C in mA.

0 ✔

0

Save | Show answer

Submit You have used 1 of 3 attempts

HW 3.4.2

7.0/7.0 points (graded)

Assume all the inputs is high that means any of the input is $V_A = V_B = V_C = 5V$.

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

Find I_L in mA. Calculate I_L for driver device.

0 ✔

0

Find I_1 in mA.

0.56 ✔

0.56

Find I_2 in mA.

0.16 ✔

0.16

Find I_B in mA.

0.39 ✔

0.39

Find I_C in mA.

2.227 ✔

2.227

Save | Show answer

Submit You have used 1 of 5 attempts

HW 3.4.3

3.0/3.0 points (graded)

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

11 ✔

11

Save | Show answer

Submit You have used 1 of 5 attempts

HW 3.4.4

4.0/4.0 points (graded)

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

If all the inputs are high ($V_A = V_B = V_C = 5V$), what is the magnitude of the noise voltage in V at the input which will cause the gate to malfunction?

3.4 ✔

3.4

If at least one inputs is low ($0.1V$), what is the magnitude of the noise voltage in V at the input which will cause the gate to malfunction?

0.9 ✔

0.9

Find the maximum power dissipation in mW of the driver circuit. Hint: use total current drawn from V_{CC}.

13.935 ✔

13.935

Save | Show answer

Submit You have used 1 of 5 attempts

HW 3.4.5

3.0/3.0 points (graded)

If we short circuited diode D1, then what will happen?

- [x] Noise margin will decrease.
- [ ] FANOUT will decrease.
- [ ] Power dissipation of driver circuit will decrease.
- [x] FANOUT will increase.
- [ ] Noise margin will increase.
- [x] Power dissipation of driver circuit will increase.

✔

Save | Show answer

Homework 3.5

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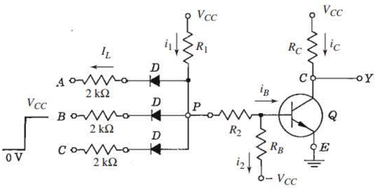
HW 3.5.1

10.0/10.0 points (graded)



In the above circuit use the following information.

The cutin or threshold voltage of diode $V_\gamma\,(Diode) = 0.6V$. This voltage is required to just turn on the diode.

The voltage across the diode while conducting is $V_D = 0.7V$.

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

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

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

The common emitter current gain of the transistors $\beta_F = 30$.

In this circuit use $V_{CC} = 12V$, $R_1 = R_2 = 15k\Omega$, $R_C = 2.2k\Omega$, $R_B = 100k\Omega$

Assume $V_A = 0.1V, V_B = V_C = 12V$.

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

Find I_L in mA. Calculate I_L for driver device.

0.5521 ✔

0.5521

Find i_1 in mA.

0.673 ✔

0.673

Find i_2 in mA.

0.121 ✔

0.121

Find I_B in mA.

0 ✔

0

Find I_C in mA.

0 ✔

0

Find power dissipated in this case in mW.

9.474 ✔

9.474

Save

Submit You have used 1 of 5 attempts

HW 3.5.2

13.0/13.0 points (graded)

In this circuit use $V_{CC} = 12V$, $R_1 = R_2 = 15k\Omega$, $R_C = 2.2k\Omega$, $R_B = 100k\Omega$

Assume $V_A = V_B = V_C = 12V$.

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

Find I_L in mA. Calculate I_L for driver device.

0 ✔

0

Find i_1 in mA.

0.37334 ✔

0.37334

Find i_2 in mA.

0.128 ✔

0.128

Find I_B in mA.

0.245334 ✔

0.245334

Find I_C in mA.

5.41 ✔

5.41

Find power dissipated in this case in mW.

70.936 ✔

70.936

Find the value of β_{min}.

22.051 ✔

22.051

Save

Submit You have used 1 of 5 attempts

HW 3.5.3

2.0/2.0 points (graded)

For this part assume inputs of the load devices are connected to driver device.

Calculate the FANOUT for this circuit.

3 ✔

3

Save