Data Tables

$V_A(V)$	$V_B(V)$	$V_{R1}(V)$	$V_{R2}(V)$	$I_{R1}(mA)$	$I_{R2}(mA)$	$V_Y(V)$
0	0	0	0	0	0	0
0	4.95	0	0.02	0	0.05	4.50
4.95	0	0.02V	0	0.05	0	4.43
4.95	4.95	0.01	0.01	0.025	0.025	4.56

Table 1: Table for OR Gate

$V_A(V)$	$V_B(V)$	$V_{R1}(V)$	$V_{R2}(V)$	$I_{R1}(mA)$	$I_{R2}(mA)$	$V_Y(V)$
0	0	0	0	0	0	0
0	4.95	-0.01	0	-0.025	0	0.41
4.95	0	0	-0.01	0	-0.025	0.45
4.95	4.95	0	0	0	0	4.90

Table 2: Table for AND Gate

V_i (V)	V_{R1} (V)	V_{R2} (V)	V_{Rc} (V)	I_1 (mA)	I_2 (mA)	I_B (mA)	I_C (mA)	V_Y (V)
0	0	0	0	0	0	0	0	4.95
4.95	4.3	0.6	4.91	0.28	0.006	0.274	2.33	0.28

Table 3: Table for RTL inverter

Report

Please answer the following questions briefly in the given space.

1. Verify that the transistor will be operating in the saturation and cutoff region in two cases for the inverter circuit (Use experimental data for verification).

Ans.

When $V_{in} = 0V$

then $V_B = 0 \therefore V_{BE} = 0V < 5V$

$I_B = 0$ mA

So, $I_C = I_E = 0$ mA

$\therefore$ output, $Y = 5V$

$\therefore$ BJT in cutoff mode

when $V_{in} = 4.95 \approx 5V$ [High voltage]

we know when transistor in saturation mode $V_{CE} = 0.2V$

we got $V_{CE} = 0.28V$ from our experiment. So, we can say it is ~~real~~ nearly to 0.2V. So, our transistor is in saturation mode.

2. For OR gate circuit, should I_{R_1} and I_{R_2} be equal theoretically when $V_A = V_B = 5V$? Did you obtain a similar result in your experiment? Explain briefly.

Ans.

Yes. Theoretically, I_{R_1} and I_{R_2} should be same when $V_A = V_B = 5V$.

Yes we got the similar result from our experiment. Though we conduct it physically but ~~&~~ two of the resistance value ~~was~~ ~~same~~ we found same. That's why we got ~~so~~ the similar I_{R_1} and I_{R_2} value from our experiment.

3. (For both OR & AND gate circuits) Will the diodes D_1 and D_2 turn ON, if $V_A = V_B = 6V$ and $V_R = 5V$? Explain briefly.

Ans.

For OR gate:

when $V_A = V_B = 6V$

p ~~type~~ terminal voltage V_{in} > n ~~type~~ terminal voltage. So,

Both diodes D_1 and D_2 will turn on.

For AND gate:-

when $V_A = V_B = 6V$

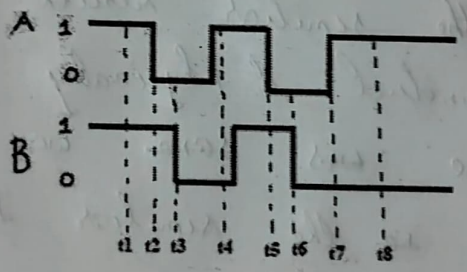
p terminal voltage < n terminal voltage (V_{in}). So,

in AND gate both diodes D_1 and D_2 will remain off.

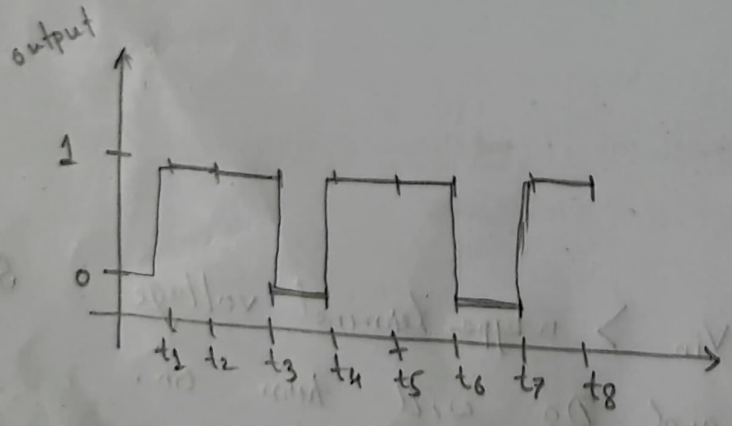
4. What is the function of $V_R = 0V$ at the base of an inverter in figure 3?

Ans. If we did not give $V_R = 0$ ~~the does not connect it to the ground~~ then base terminal of BJT cannot be greater than 0. Basically for cutoff mode we need to se $V_B = 0$ V. If $V_R = 0$ and $V_{in} = 0$ then ($V_R = 0$) helps us to get $V_B = 0$ V.

5. Assuming OR gate, Draw the output.



Ans.



Data Tables

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0	0	0	0	0	0	0
0	4.95	0	0.02	0	0.05	4.50
4.95	0	0.02v	0v	0.05	0	4.43
4.95	4.95	0.01	0.01	0.025	0.025	4.56

Table 4: Table for OR Gate

$V_A(V)$	$V_B(V)$	$V_{R1}(V)$	$V_{R2}(V)$	$I_{R1}(mA)$	$I_{R2}(mA)$	$V_Y(V)$
0	0	0	0	0	0	0
0	4.95	-0.01	0	-0.025	0	0.41
4.95	0	0	-0.01	0	-0.025	0.45
4.95	4.95	0	0	0	0	4.90

Table 5: Table for AND Gate

V_i (V)	V_{R1} (V)	V_{R2} (V)	V_{Rc} (V)	I_1 (mA)	I_2 (mA)	I_B (mA)	I_C (mA)	V_Y (V)
0	0	0	0	0	0	0	0	4.95
4.95	4.3	0.6	4.91	0.28	0.006	0.274	2.33	0.28

Table 6: Table for RTL inverter

Signature

29-9-2024