

Subject:

الأسس الإلكترونية

/ /

$$R_B = 10K \Omega$$

$$R_C = 1K \Omega$$

$$V_{CC} = 5V$$

$$\beta_f = 25$$

$$V_{OH} = \frac{5 - 0.2}{25.1K} \cdot 10K + 0.8 = 2.7V$$

$$I_{OH} = \frac{5 - 2.7}{1K} = 2.3mA$$

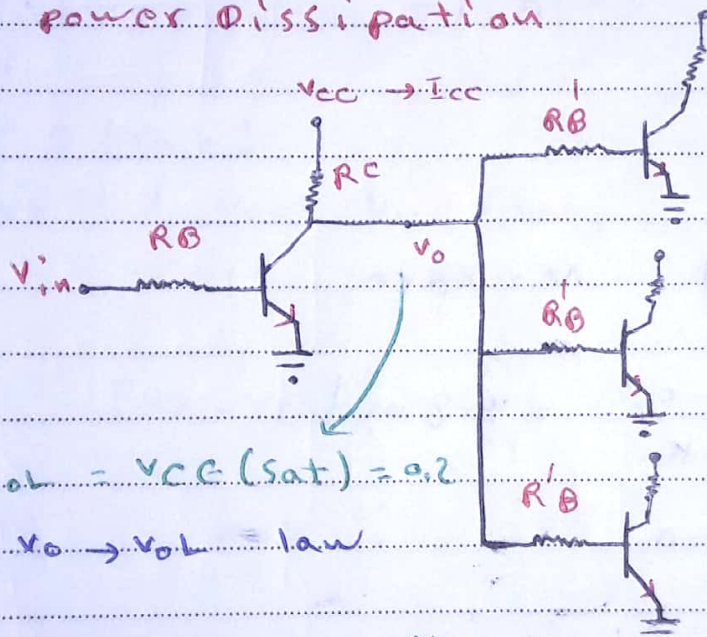
$$I_i = \frac{2.7 - 0.8}{10K} = 0.19mA$$

$$N = \frac{I_o}{I_i} = \frac{2.3mA}{0.19mA} = 12.19 = 12$$

RTL

① Inverter

* power dissipation



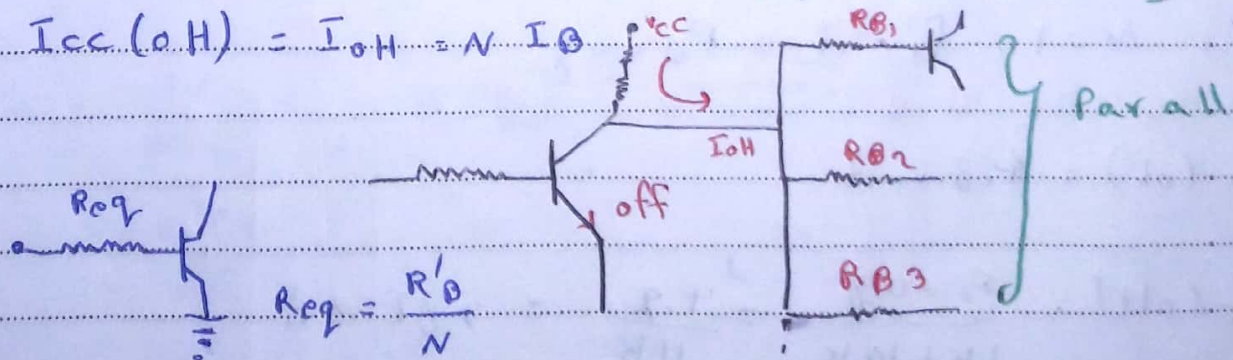
$$V_{OL} = V_{CE(sat)} = 0.2$$

$$\textcircled{1} V_o \rightarrow V_{OL} = \text{low}$$

$$I_{CC(OL)} = I_{RC} = \frac{V_{CC} - V_{CE(sat)}}{R_C}$$

والتي هي 2.3mA ويوجد لها (0.2V)

$$\textcircled{2} I_{CC(OH)} = I_{OH} = N I_B$$



R_{eq}

$$R_{eq} = \frac{R'_B}{N}$$

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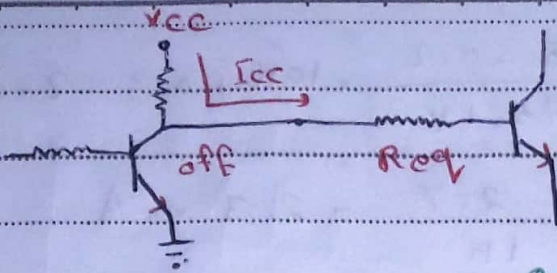
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R R B N

S Notebook

Subject:



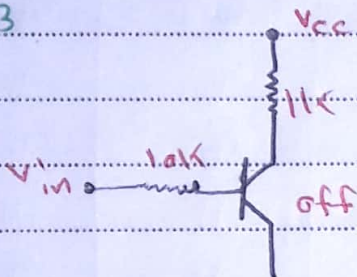
تعبئة الدارة
هنا

$$I_{CC(OH)} = \frac{V_{CC} - V_{CE(sat)}}{R_C + \frac{R_B}{N}}$$

$$P = V I$$

$$I_{avg} = \frac{I_{CC(OH)} + I_{CC(OL)}}{2}$$

ex 5.3



$\beta = 2.5$

① $P_{o,avg}$ (No loads) $N = \infty$

$$I_{CC(OL)} = I_{RC} = \frac{5 - 0.2}{1k} = 4.8 \text{ mA}$$

$$I_{CC(OH)} = \text{zero}, N = 0$$

$$P_{o,avg} = \frac{4.8 \text{ m} + \text{zero}}{2} \times 5 = 12 \text{ mW}$$

② $N = 1$ find $P_{o,avg}$

$$I_{CC(OL)} = 4.8 \text{ mA}$$

$$I_{CC(OH)} = \frac{5 - 0.2}{1k + 10k} = \frac{4.8}{11k} = 382 \text{ mA}$$

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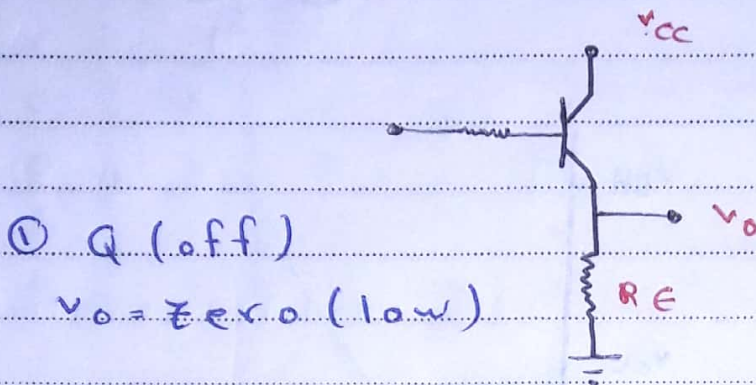
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$$P_{avg} = \frac{4.8m + 382m}{2} * 5 = 12.96mw$$

RTL (Inverter)

RTL (non Inverter)

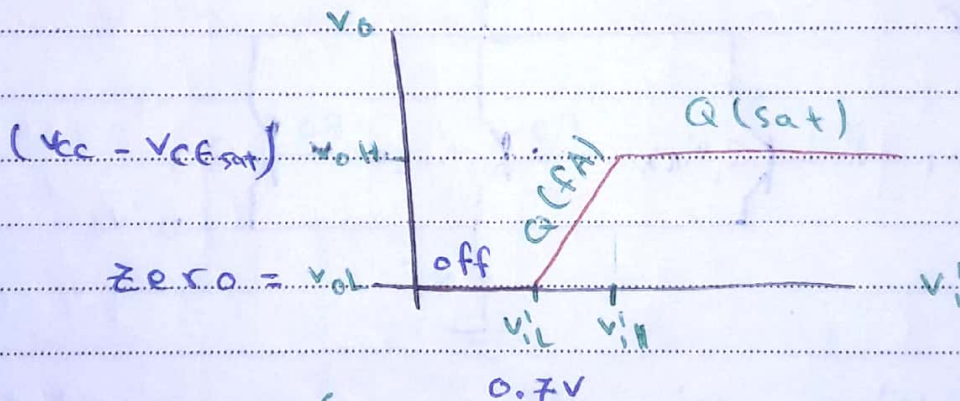


① Q (off)

$V_O = \text{zero (low)}$

② Q (sat)

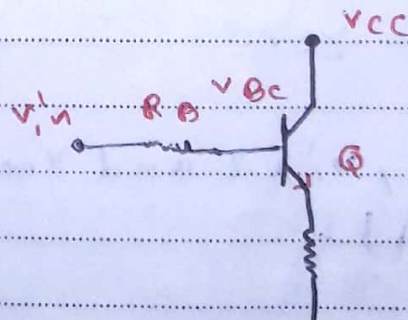
$$V_C(H) = V_{CC} - V_{CE(sat)}$$



$$V_{IH} = I_B R_B + V_{OC} + V_{CC}$$

$$I_B = \frac{I_E}{\beta + 1} = \frac{1}{\beta + 1} * V_{OC}$$

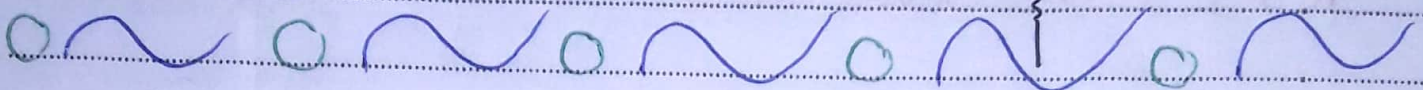
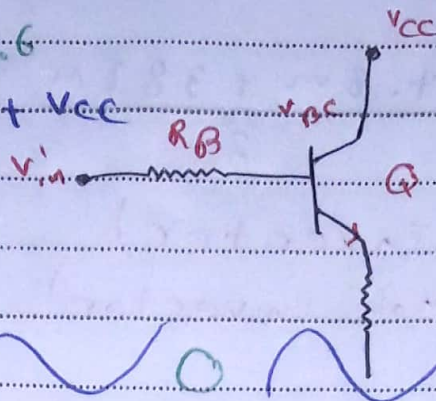
$$\frac{V_{CC}}{R_E} = \frac{V_{CE(sat)}}{R_E}$$



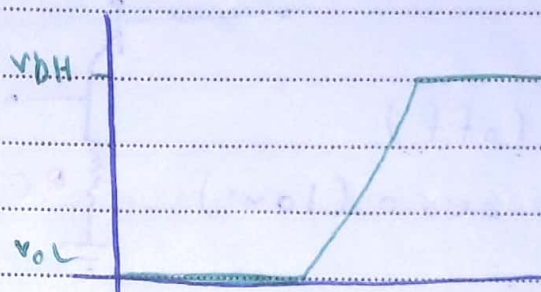
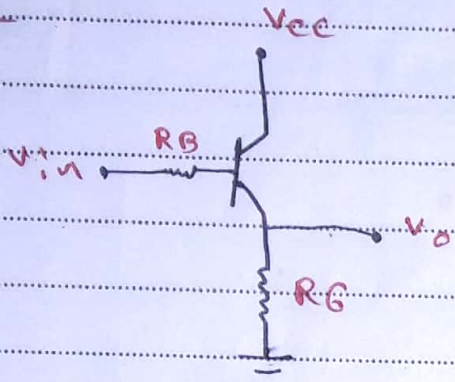
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$$v_{inH} = I_B R_B + V_{BE} + V_{CE}$$

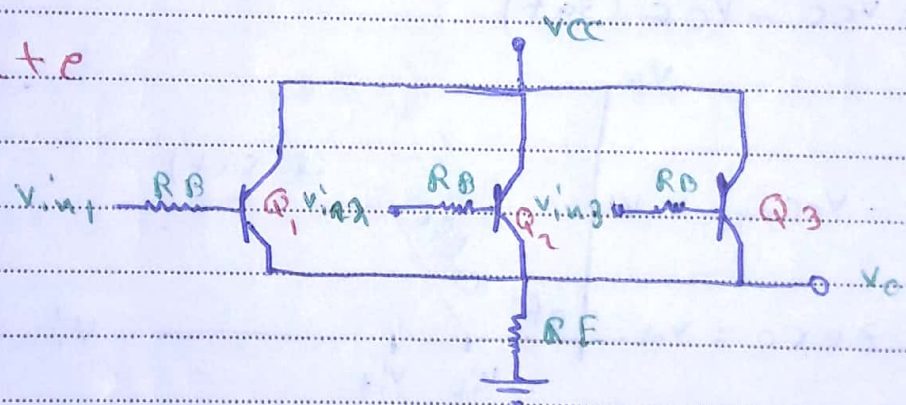


R.T.L



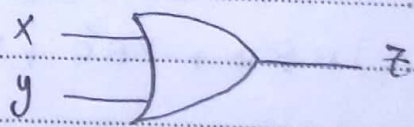
((non Inverter))

OR gate



$$v_{in1} = v_{in2} = v_{in3} = v_{inL}$$

$$v_o = \text{zero}$$



$$v_{in1} = H, v_{in2} \text{ and } v_{in3} (H) \\ v_o (H)$$

x	y	z
0	0	0
0	1	1
1	0	1
1	1	1

all the inputs are 0 and 1

S

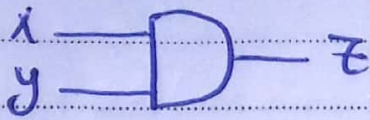
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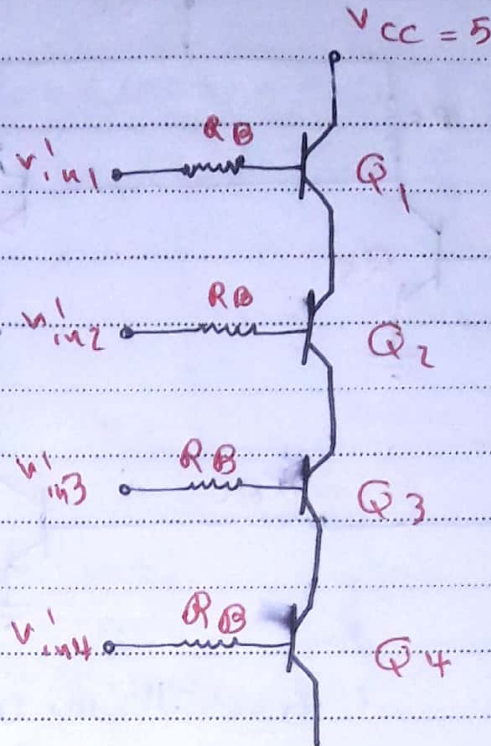
R

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AND gate



x	y	z
0	0	0
0	1	0
1	0	0
1	1	1

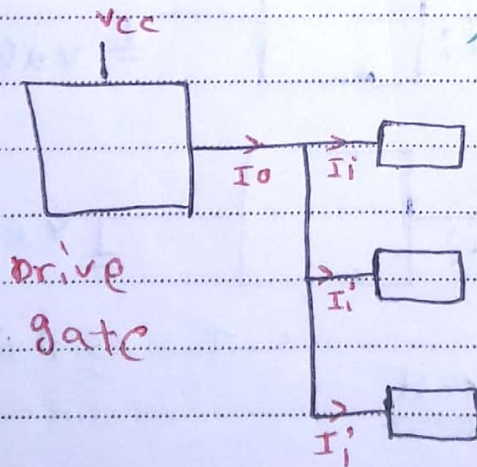


$$V_o = V_{CC} - V_{CE(sat)} (N) \rightarrow P_{Diss}$$

of Input

RTL with active pull-up

من 25/500



$$N = \frac{I_o}{I_i'}$$

(load)

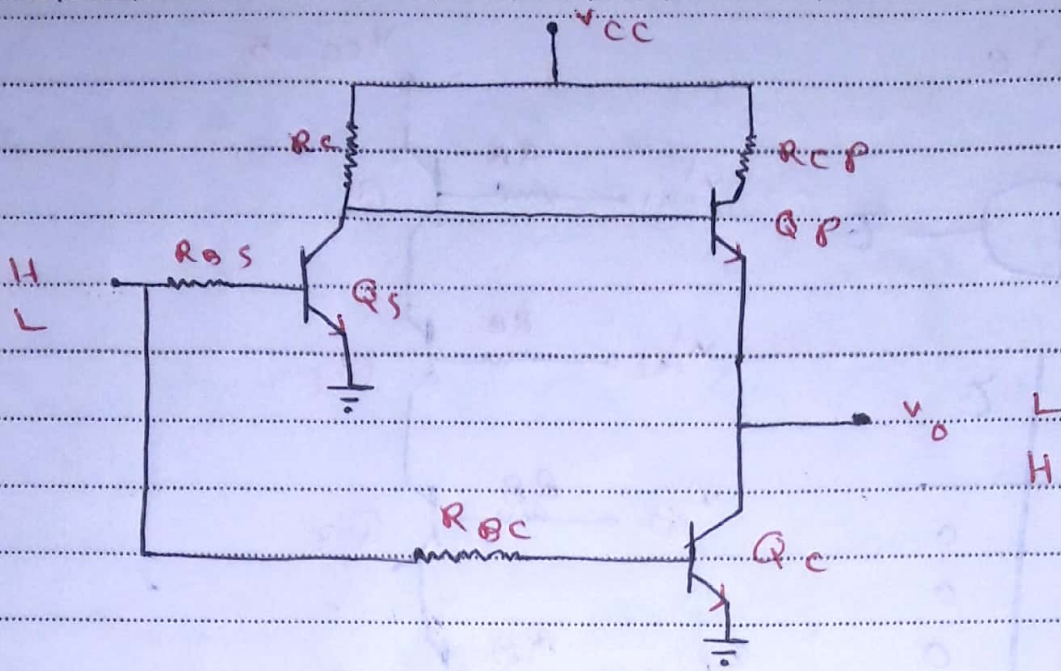
EX

$$N=12 \rightarrow P_D = 12.96 \text{ mW}$$

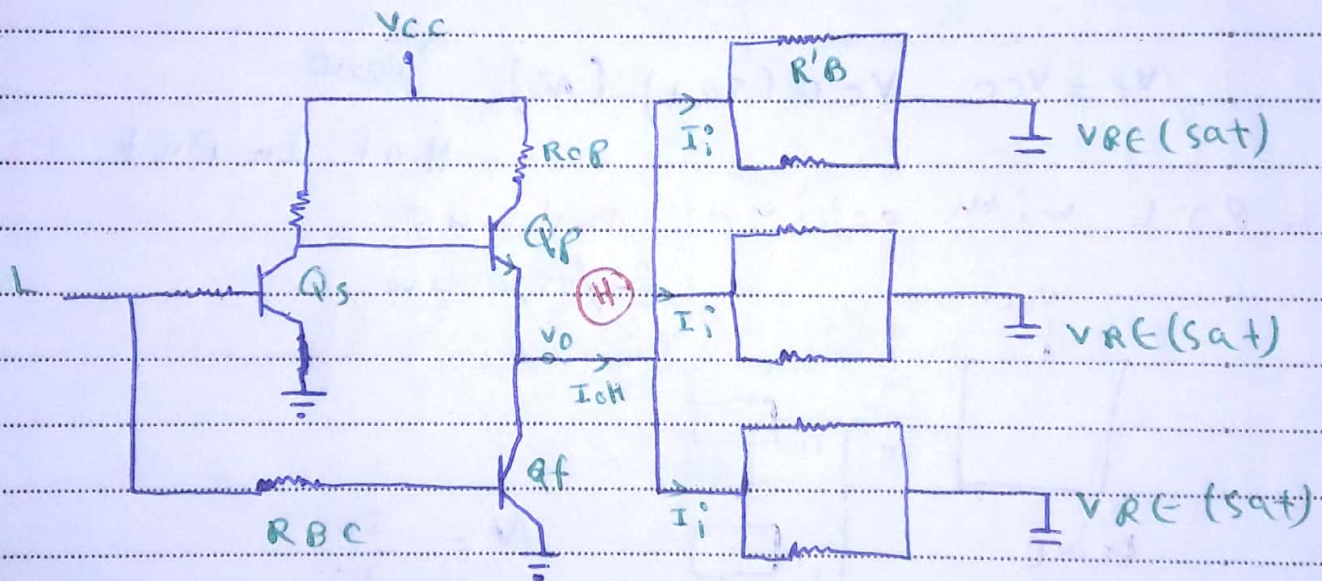
$$N=48 \rightarrow P_D = 20 \text{ mW}$$

المنفذ / باءة ال (N)
وكن ما لا يزيد 25 P_D

Subject:



قالب Invert parallel و (و) الـ Invert



توازي R'_B

$$I_{oH} = \frac{V_{CC} - V_{CEP}(sat) - v_{oH}}{R_{cp}}$$

$$I'_{iH} = \frac{v_{oH} - V_{RE}(sat)}{R'_B / 2n}$$

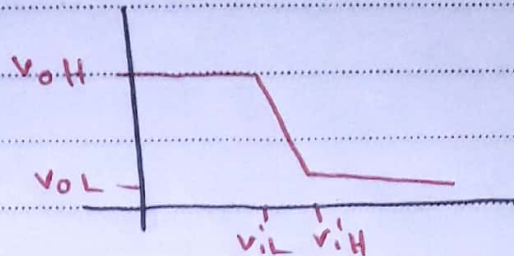
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20/02/20

$$N = \frac{I_{OH}}{I_{IH}} = \frac{V_{CC} - V_{CE(sat)} - V_{OH}}{V_{OH} - V_{RE(sat)}} \cdot \frac{R_B}{2 R_{OP}}$$

$$V_{OH(min)} = V_{IH}$$



$$V_{IH} = I_B R_{BS} + V_{RE(sat)}$$

$$V_{OH(min)} = V_{IH} = \frac{V_{CC} - V_{CE(sat)} (R_B)}{\beta \cdot R_C} + V_{BE(sat)}$$

