

**Question No. 1**

For the given DTL NAND circuit, use  $V_{cc}=10V$ ,  $R_1=2k\Omega$ ,  $R_i=5k\Omega$ ,  $R_i=2k\Omega$ .

Assume common emitter current gain,  $\beta_F=30$  and  $V_{OH}=9.5V$ ,  $V_{OL}=0.1V$ . Also assume for saturation mode  $V_{BE}=0.8V$ ,  $V_{CE(SAT)}=0.1V$  and cut in voltage for transistor  $V_{\gamma_T}=0.5V$ , cut in voltage for Diode,  $V_{\gamma_D}=0.6V$ .

(a)	Find the value of $\beta_{Min}$ when all inputs are logical High (10V).
(b)	Find the maximum fanout ( Hint. find fanout for each case and calculate maximum fanout from it)
(c)	Find the power dissipation for all cases[Assume N load connected; N= maximum Fanout]
(d)	If all the inputs are high ( $V_A=V_B=V_C=10V$ ), what is the magnitude of the noise voltage in V at the 1 input A, which will cause the gate to malfunction?
(e)	If at least one input is low (0.1V), what is the magnitude of the noise voltage in V at the input A, which will cause the gate to malfunction?

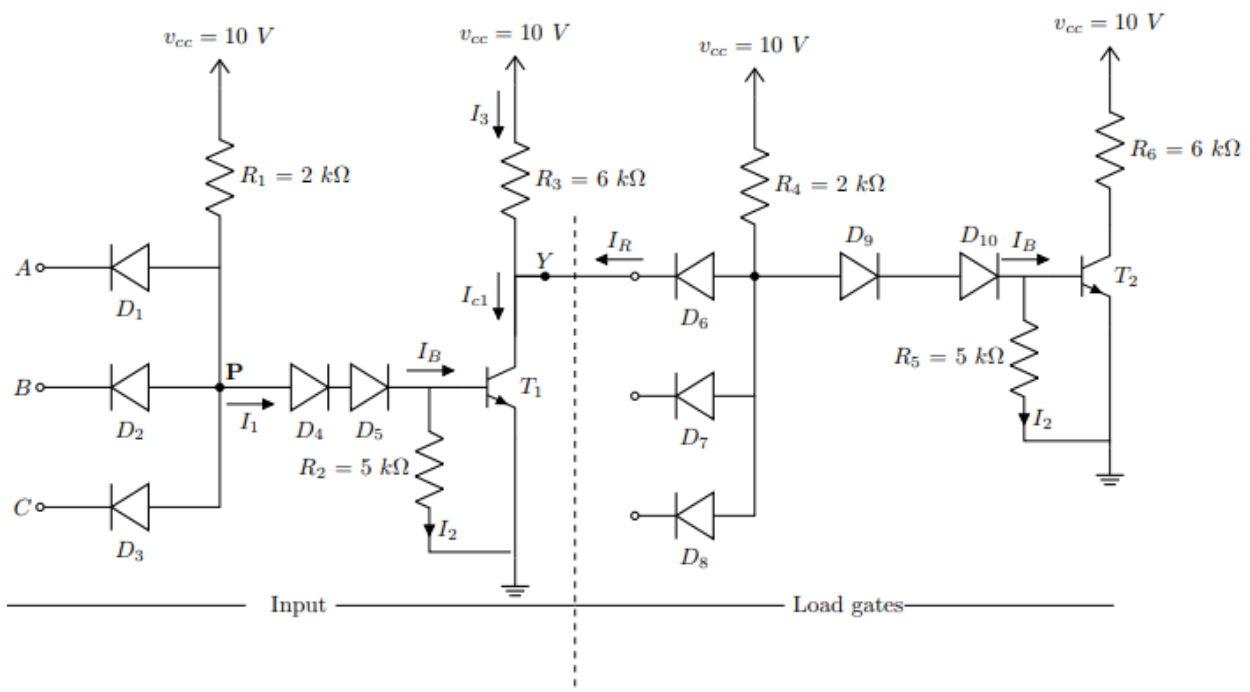


Figure 1

**For the given modified DTL NAND circuit, use  $V_{cc}=12V$ . Assume common emitter current gain,  $\beta_f=30$  and  $V_{OH}=11.5\text{ V}$ ,  $V_{OL}=0.1V$ . Also assume for saturation mode  $V_{BE}=0.8V$ , forward active mode  $V_{BE}=0.7V$ ,  $V_{CE(SAT)}=0.1\text{ V}$  and cut in voltage for transistor  $V_{\gamma_i}=0.5V$ , cut in voltage for diode,  $V_{\gamma_d}=0.6V$ .**

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Figure 2

### Question No. 3

For the given DTL NAND circuit, assume common emitter current gain,  $\beta_r=30$ . Also assume for saturation mode  $V_{BE}=0.8V$ ,  $V_{CE(SAT)}=0.1V$  and cut in voltage for transistor  $V_{\gamma_r}=0.5V$ , cut in voltage for transistor  $V_{\gamma_b}=0.6V$ .

(a)	Find $I_1$ , $I_2$ , $I_B$ , $I_C$ and $I_L$ if any input is logical low (0.1V).
(b)	Find $I_1$ , $I_2$ , $I_B$ , $I_C$ and $I_L$ if all inputs are logical High (10V).
(c)	Find the value of $\beta_{min}$ when all inputs are logical High (10V). ( Hint: find only for Transistor Q of driver)
(d)	Find the power dissipation for the conditions of both (a) and (b) for the driver [Assume no load connected]
(e)	Find the maximum fanout ( Hint: find fanout for each case and calculate maximum fanout from it)

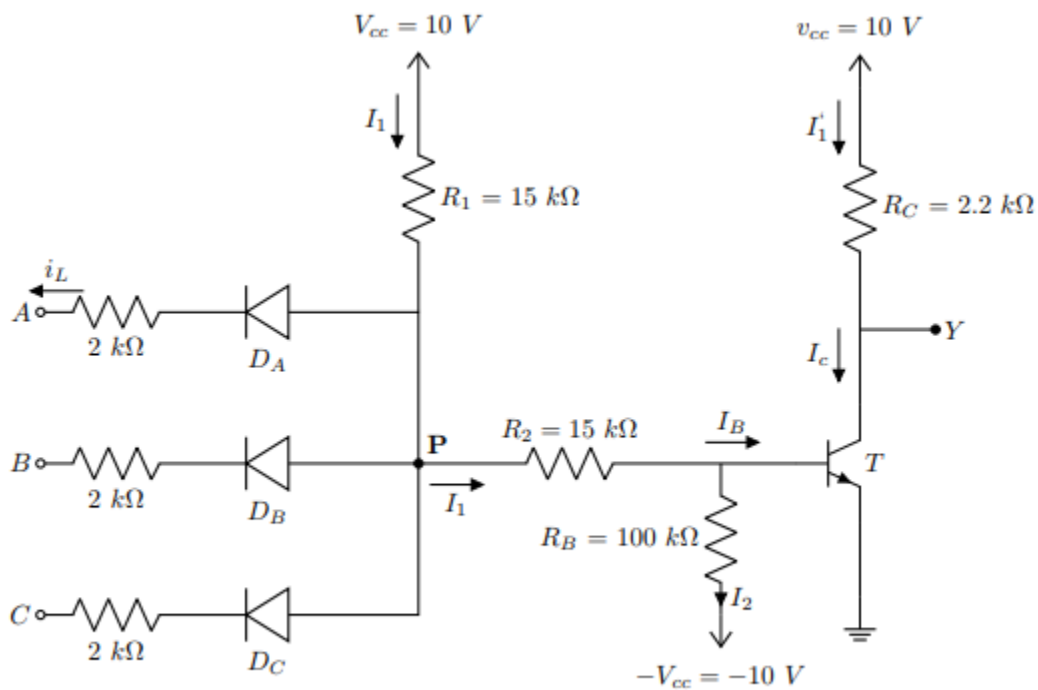


Figure 3