

10-6) (a) Using the actual output transistors of open-collector TTL gates, show (by means of a truth table) that when connected together to an external resistor and V_{CC} , the wired connection produces an AND function

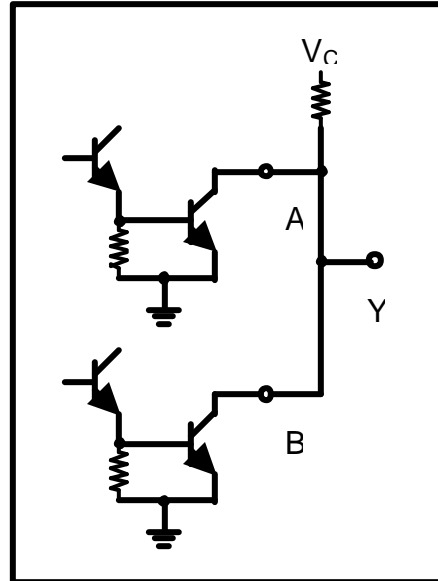
(b) Prove that two open-collector TTL inverters, when connected together, produce the NOR function.

(a) A and B are the outputs of the two open collector devices. Either open collector output “pulls-down” the voltage at Y.

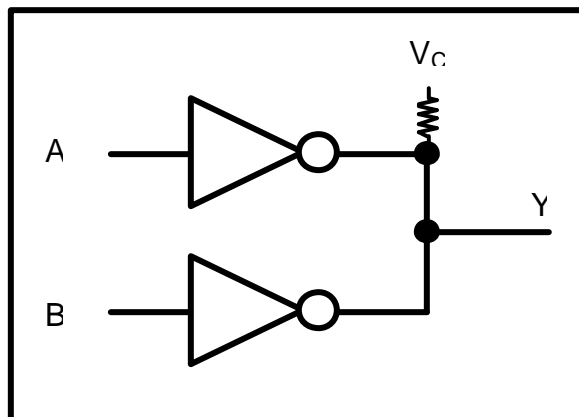
Truth table:

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

$$Y = AB$$



(b) From above, we see that the outputs of two open collector gates, when put in parallel, create an AND function. So $Y = A'B'$. But, by DeMorgan's Law, $A'B' = A' + B'$. Thus, two open collector inverters in parallel create a NOR function.



10-11) Using the NOR outputs of two ECL gates, show that when connected together to an external resistor and negative supply voltage, the wired connection produces an OR function

Either output, A or B, in the Logic 1 (Ground) state can pull the output Y to Ground. Only when both are in the 0 state (V_{EE}) will the output be allowed to change to the Logic 0 state:

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

So $Y = A + B$

