

電路學(EE2210)第四次隨堂考

2015年4月1日

時間：10分鐘

Close Book

學號： _____

姓名： _____

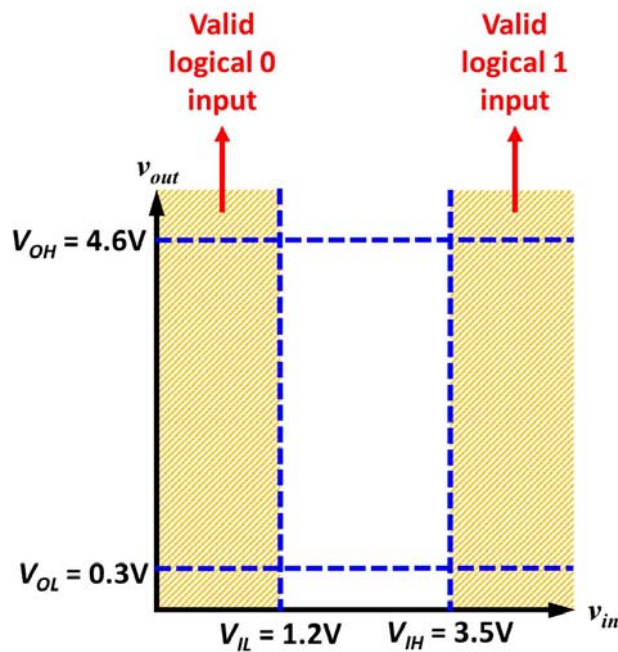
Consider a family of logic gates which operates under the static discipline with the following voltage thresholds:
 $V_{IL} = 1.2\text{ V}$, $V_{OL} = 0.3\text{ V}$, $V_{IH} = 3.5\text{ V}$, and $V_{OH} = 4.6\text{ V}$.

- (a) What is the highest voltage that must be interpreted by a receiver as a logical 0? (14%)
- (b) What is the lowest voltage that must be interpreted by a receiver as a logical 1? (14%)
- (c) What is the highest voltage that can be output by an inverter for a logical 0 output? (14%)
- (d) What is the lowest voltage that can be output by an inverter for a logical 1 output? (14%)
- (e) What range of voltages will be treated as invalid under this discipline? (14%)
- (f) What are its noise margins (NM_0 , NM_1)? (30%)

Solutions:

(a) & (b)

The valid voltage ranges for logical input signal can be found from the following figure under this static discipline.

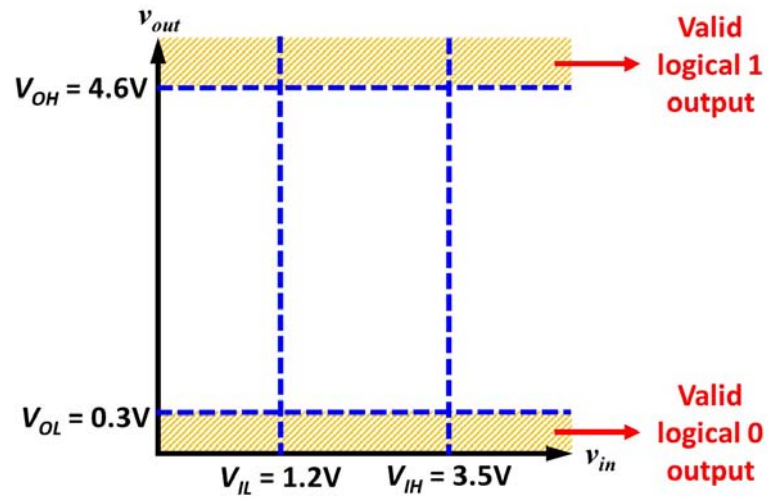


Therefore,

the highest voltage that must be interpreted by a receiver as a logical 0 is $V_{IL} = 1.2\text{V}$, and the lowest voltage that must be interpreted by a receiver as a logical 1 is $V_{IH} = 3.5\text{V}$.

(c) & (d)

The valid voltage ranges for logical output signal can be found from the following figure under this static discipline.



Therefore,
the highest voltage that can be a logical 0 output is $V_{OL} = 0.3\text{V}$, and
the lowest voltage that can be a logical 1 output is $V_{OH} = 4.6\text{V}$.

(e)
The range of voltages $1.2\text{V} < v < 3.5\text{V}$ will be treated as invalid under this discipline.

(f)
 $NM_0 = V_{IL} - V_{OL} = 0.9\text{V}$
 $NM_1 = V_{OH} - V_{IH} = 1.1\text{V}$

(a) 1.2V, (b) 3.5V, (c) 0.3V, (d) 4.6V,
(e) $1.2\text{V} < v < 3.5\text{V}$, (f) $NM_0 =$ 0.9V, $NM_1 =$ 1.1V.