電路學(EE2210)第四次隨堂考

2016年10月19日
時間：10 分鐘
Close Book

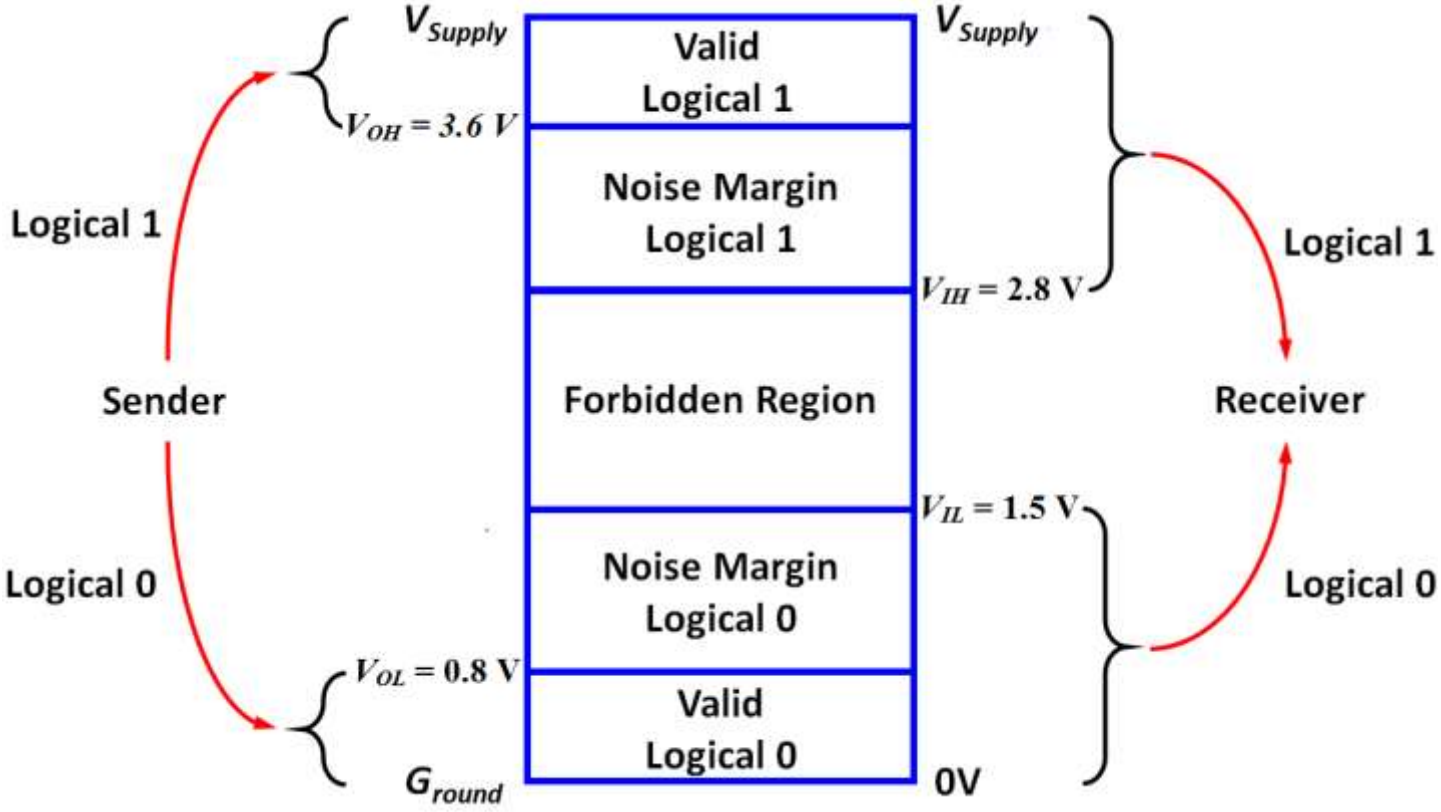
學號：_____

姓名：_____

Consider a family of logic gates which operates under the static discipline with the following voltage thresholds: V_{IL} = 1.5 V, V_{OL} = 0.8 V, V_{IH} = 2.8 V, and V_{OH} = 3.6 V.

(a) What is the highest voltage that must be interpreted by a receiver as a logical 0? (12.5%)
(b) What is the lowest voltage that must be interpreted by a receiver as a logical 1? (12.5%)
(c) What is the highest voltage that can be output by an inverter for a logical 0 output? (12.5%)
(d) What is the lowest voltage that can be output by an inverter for a logical 1 output? (12.5%)
(e) What range of voltages will be treated as invalid under this discipline? (12.5%)
(f) What are its noise margins (NM_0, NM_1)? (25%)
(g) Will this logic gate family drive the input of another logic gate family is characterized by the voltage thresholds: V_{IL} = 1.8 V, V_{OL} = 1.1 V, V_{IH} = 2.5 V, and V_{OH} = 3.3 V correctly? (Yes or No) (12.5%)

Solutions:
(a) & (b)
The valid voltage ranges for logical input signal can be found from the following figure under this static discipline.



Therefore
(a) the highest voltage that must be interpreted by a receiver as a logical 0 is V_{IL} = 1.5V, and
(b)the lowest voltage that must be interpreted by a receiver as a logical 1 is V_{IH} = 2.8V.

(c) & (d)
The valid voltage ranges for logical output signal can be found from the figure of last page under this static discipline.

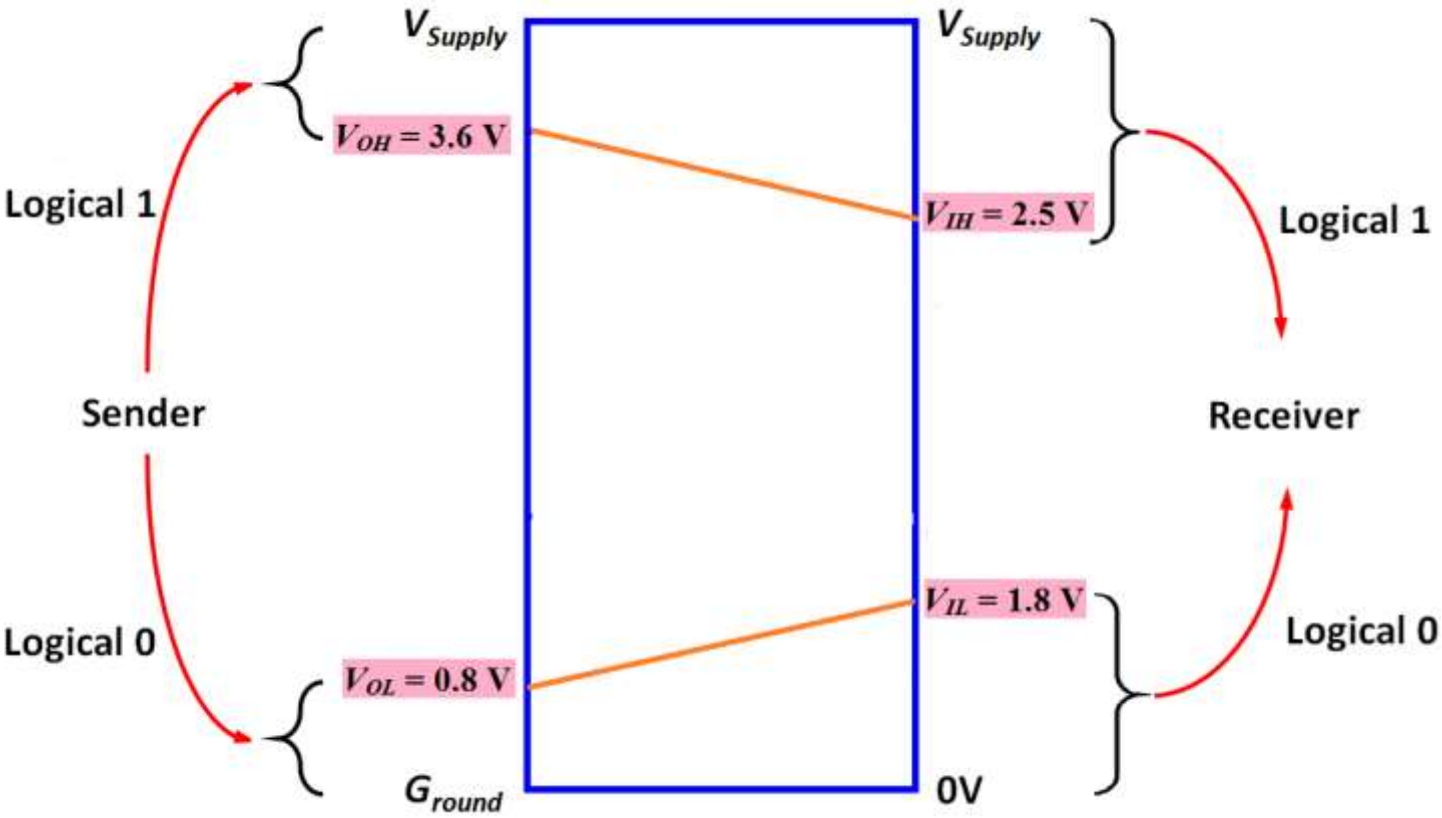
Therefore,

(c) the highest voltage that can be a logical 0 output is V_{OL} = 0.8V, and
(d) the lowest voltage that can be a logical 1 output is V_{OH} = 3.6V.

(e)
The range of voltages 1.5V < v < 2.8V will be treated as invalid under this discipline.

(f)
$NM_0 = V_{IL} - V_{OL}$ = 0.7V
$NM_1 = V_{OH} - V_{IH}$ = 0.8V

(g)



Ans: Yes, with better NM_0 = 1 V instead of 0.7 V and NM_1 = 1.1 V instead of 0.8 V.

(a) _____, (b) _____, (c) _____, (d) _____,

(e) _____, (f) NM_0 = _____, NM_1 = _____.

(g)_____