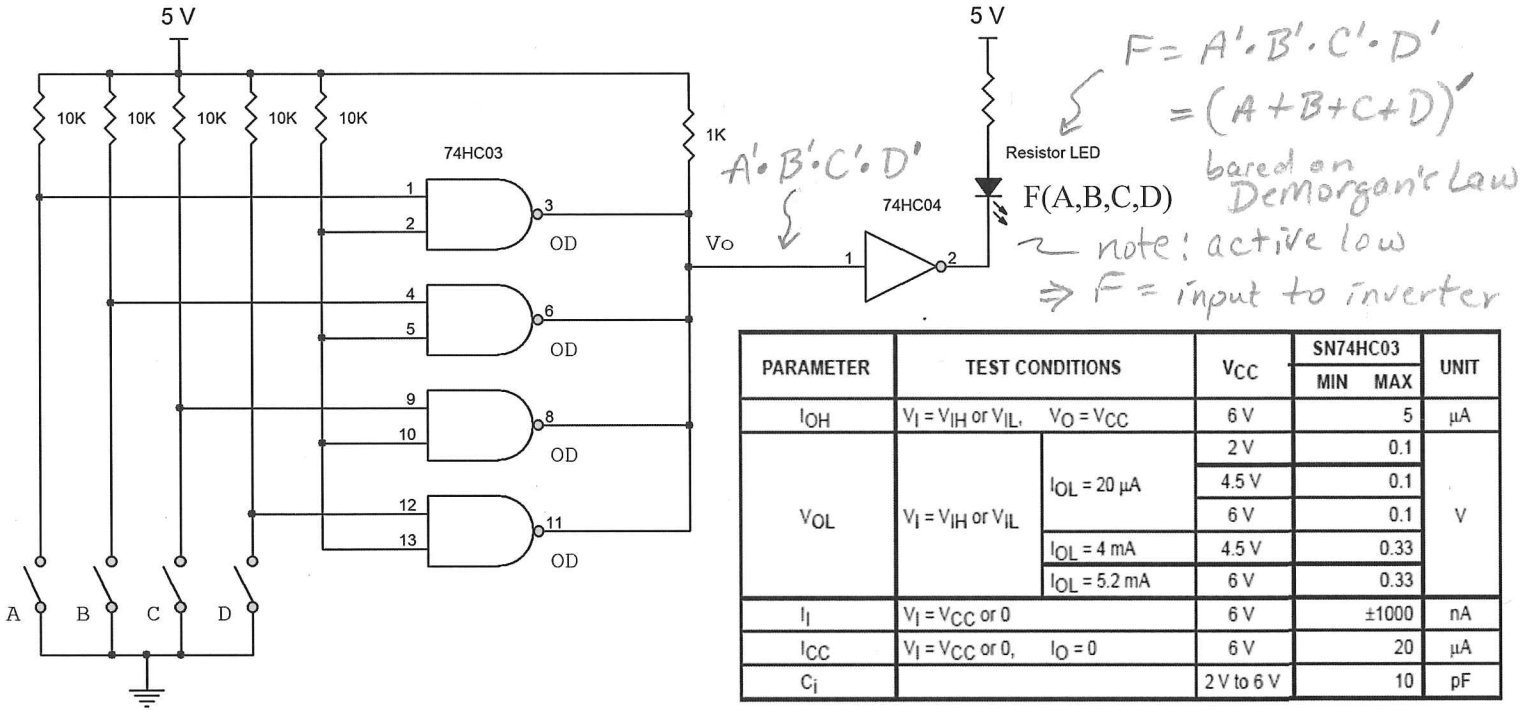
Practice Quiz 4

Closed Book and Notes – TI 30II XS Calculator Allowed



PARAMETER	TEST CONDITIONS		V_{CC}	SN74HC03 MIN	SN74HC03 MAX	UNIT
I_{OH}	$V_I = V_{IH}$ or V_{IL}, $V_O = V_{CC}$		6 V		5	µA
V_{OL}	$V_I = V_{IH}$ or V_{IL}	I_{OL} = 20 µA	2 V		0.1	V
			4.5 V		0.1	
			6 V		0.1	
		I_{OL} = 4 mA	4.5 V		0.33	
		I_{OL} = 5.2 mA	6 V		0.33	
I_I	$V_I = V_{CC}$ or 0		6 V		±1000	nA
I_{CC}	$V_I = V_{CC}$ or 0, I_O = 0		6 V		20	µA
C_i			2 V to 6 V		10	pF

1. Assuming that **F(A,B,C,D) = 1** corresponds to the **LED being illuminated (note active low current sinking configuration)**, the function realized by this circuit is:

   (A) F = A•B•C•D (B) F = (A•B•C•D)′ (C) F = A+B+C+D (D) F = (A+B+C+D)′ (E) none of these

2. Based on a specified I_{OL} of 4 mA @ V_{OL} of 0.33 V, the **ON resistance** of a 74HC03 open-drain output relative to ground is approximately:

   (A) 83 Ω (B) 1000 Ω (C) 1168 Ω (D) 30 KΩ (E) none of these

   $R_{on} = 0.33V / 0.004 = 82.5\Omega$

3. Based on a specified I_{OLmax} of 4 mA @ V_{OL} of 0.33 V, the **minimum value of pull-up resistor** used (R_{min}) should be approximately:

   "worst case" is one O.D. "on" (ignore leakage)

   (A) 83 Ω (B) 1000 Ω (C) 1168 Ω (D) 30 KΩ (E) none of these

   $V_{R_{min}} = 5 - 0.33 = 4.67V$ $R_{min} = \frac{4.67V}{0.004} = 1167.5$

4. Based on a desired V_{IHmin} of 4.37 V @ I_{IH} of 1 µA at the input to the 74HC04 inverter, the **maximum value of pull-up resistor** used (R_{max}) should be approximately:

   $I_R = 4 \times 5\mu A + 1\mu A = 21\mu A$

   (A) 83 Ω (B) 1000 Ω (C) 1168 Ω (D) 30 KΩ (E) none of these

   $V_{Rmax} = 5 - 4.37 = 0.63V$ $R_{max} = \frac{0.63V}{21\mu A} = 30,000\Omega$

5. When A=L, B=L, C=L, and D=H, the **current sunk** by the **active** open-drain gate in the circuit as shown (with a 1000 Ω pull-up resistor) will be approximately:

   (A) 0 mA (B) 1.6 mA (C) 4.0 mA (D) 4.6 mA (E) none of these

   $R_{eq} = \underset{\text{resistor}}{1000} + \underset{R_{on}}{83} = 1083$ $I_{OL} = \frac{5}{1083} = 4.6mA$