Practice Quiz 3

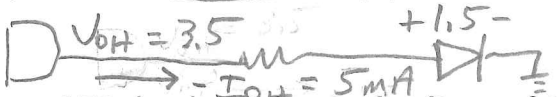
Closed Book and Notes – TI 30II XS Calculator Allowed

Table 1. DC Characteristics of a Hypothetical Logic Family.

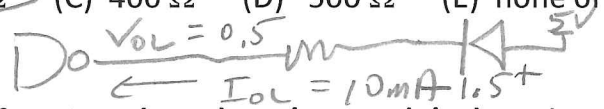
V_{CC} = 5 V	V_{OH} = 3.50 V	V_{OL} = 0.50 V	V_{IH} = 2.50 V	V_{IL} = 1.00 V
$V_{TH} = (V_{OH} - V_{OL})/2$	I_{OH} = –5.0 mA	I_{OL} = 10 mA	I_{IH} = 500 µA	I_{IL} = –1.0 mA

1. A microcontroller designed to operate over a power supply range of **2 V to 5 V** and a clock frequency range of **0 to 100 MHz** dissipates a maximum of **500 mW.** If the supply voltage used is **2 V** and the clock frequency is **100 MHz**, the power dissipation of the microcontroller will be reduced to:
   (A) 80 mW (B) 100 mW (C) 180 mW (D) 200 mW (E) none of these
   $(2/5)^2 \times 500 = 80\,mW$

2. A microcontroller designed to operate over a power supply range of **2 V to 5 V** and a clock frequency range of **0 to 100 MHz** dissipates a maximum of **500 mW.** If the supply voltage used is **5 V** and the clock frequency is **1 Hz**, the power dissipation of the microcontroller will be reduced to:
   (A) 80 mW (B) 100 mW (C) 180 mW (D) 200 mW (E) none of these
   $1/10^8 \times 500 = 5 \times 10^{-6}\,mW$

3. When interfacing an **LED** that has a **forward voltage of 1.5 V** to the logic family described in Table 1 using a ***current sourcing*** configuration, **maximum brightness** will be achieved (within the rated specifications) using a current limiting resistor of the value:
   (A) 200 Ω (B) 300 Ω (C) 400 Ω (D) 500 Ω (E) none of these
   

   $V_R = 3.5 - 1.5 = 2V$
   $R = 2/0.005 = 400\,\Omega$

4. When interfacing an **LED** that has a **forward voltage of 1.5 V** to the logic family described in Table 1 using a ***current sinking*** configuration, **maximum brightness** will be achieved (within the rated specifications) using a current limiting resistor of the value:
   (A) 200 Ω (B) 300 Ω (C) 400 Ω (D) 500 Ω (E) none of these
   

   $V_R = 5 - 0.5 - 1.5 = 3$
   $R = 3/0.01 = 300\,\Omega$

5. The **complement** of the function **F(X,Y,Z) = X′•Y + X•(Y′+Z)** can be expressed as:
   (A) **F′ (X,Y,Z) = X•Y + X′•Y′•Z**
   (B) **F′ (X,Y,Z) = X′•Y′ + X•Y•Z′**
   (C) **F′ (X,Y,Z) = X•Y′ + X′•(Y+Z′)**
   (D) **F′ (X,Y,Z) = (X′+Y)•(X+Y′)•(X+Z)**
   (E) none of the above

   $F = X'Y + XY' + XZ$
   $F' = (X+Y') \cdot (X'+Y) \cdot (X'+Z')$
   $= (XY + X'Y')(X'+Z')$
   $= X'Y' + XYZ' + X'Y'Z'$
   $= X'Y'(1+Z') + XYZ'$