Lab Quiz 4

Closed Book and Notes – TI 30II XS Calculator Allowed

1. A microcontroller designed to operate over a power supply range of **1.2 V to 3.3 V** and a clock frequency range of **0 to 100 MHz** dissipates a maximum of **500 mW.** If the supply voltage used is **1.475 V** and the clock frequency is **100 MHz**, the power dissipation of the microcontroller will be reduced to approximately:
   (A) 25 mW (B) 50 mW (C) 75 mW (D) 100 mW (E) none of these

   $(1.475/3.3)^2 \times 500 = 99.9$ mW

2. A microcontroller designed to operate over a power supply range of **1.2 V to 3.3 V** and a clock frequency range of **0 to 100 MHz** dissipates a maximum of **500 mW.** If the supply voltage used is **3.3 V** and the clock frequency is **5 MHz**, the power dissipation of the microcontroller will be reduced to approximately:
   (A) 25 mW (B) 50 mW (C) 75 mW (D) 100 mW (E) none of these

   $5/100 \times 500 = 25$ mW

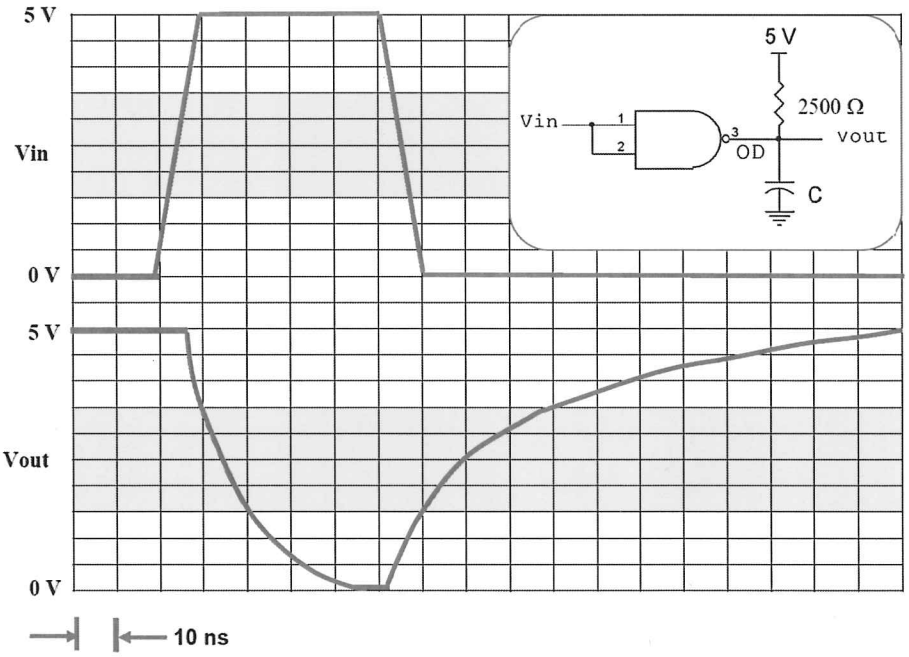
3. If a CMOS **gate input voltage** is **70% of its V_{cc}** (power supply) voltage, then:
   (A) the logic gate will dissipate ***less* power** than it would if the input was 10% of its power supply voltage
   (B) the logic gate will dissipate ***less* power** than it would if the input was 90% of its power supply voltage
   (C) the logic gate will dissipate ***more* power** than it would if the input was *either* 10% *or* 90% of its power supply voltage
   (D) the logic gate will dissipate ***virtually no* power**
   (E) none of the above

   ↳ Ref. p. 17 of Lecture Summary Notes

4. Based on the timing diagram below, estimate the value of the capacitor (C):
   (A) 10 pF (B) 12 pF (C) 15 pF (D) 18 pF (E) none of these

   rise time = 30 ns
   $2500 \times C = 30 \times 10^{-9}$
   $C = \frac{30 \times 10^{-9}}{2.5 \times 10^3}$
   $= 12 \times 10^{-12}$
   $= 12$ pF

5. Based on the timing diagram below, estimate the ON resistance of the open-drain NAND gate:
   (A) 250 Ω (B) 567 Ω (C) 833 Ω (D) 1000 Ω (E) none of these



fall time = 10 ns
$R_{on} \times 12 \times 10^{-12} = 10 \times 10^{-9}$
$R_{on} = \frac{10 \times 10^{-9}}{12 \times 10^{-12}}$
$= 0.833 \times 10^3$
$= 833\ \Omega$

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