

### Lab Quiz 3

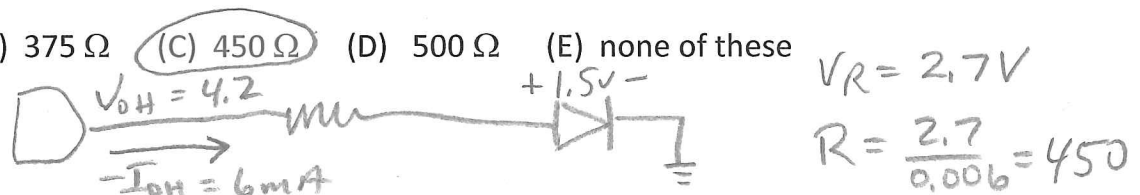
Closed Book and Notes – TI 30II XS Calculator Allowed

Table 1. DC Characteristics of a Hypothetical Logic Family.

$V_{CC} = 5\text{ V}$	$V_{OH} = 4.20\text{ V}$	$V_{OL} = 0.50\text{ V}$	$V_{IH} = 3.7\text{ V}$	$V_{IL} = 1.2\text{ V}$
$V_{TH} = (V_{OH} - V_{OL})/2$	$I_{OH} = -6.0\text{ mA}$	$I_{OL} = 8.0\text{ mA}$	$I_{IH} = 10\text{ }\mu\text{A}$	$I_{IL} = -10\text{ }\mu\text{A}$

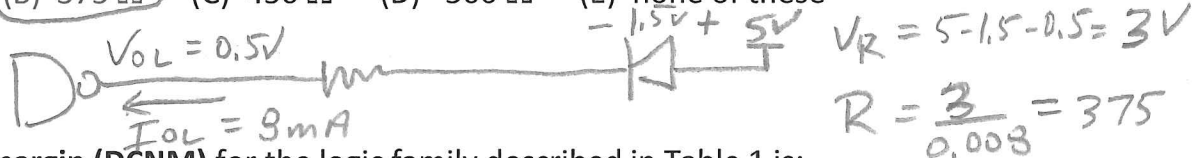
1. When interfacing an **LED** that has a **forward voltage of 1.5 V** to the logic family described in Table 1 using a **current sourcing** configuration, **maximum brightness** will be achieved (within the rated specifications) using a current limiting resistor of the value:

(A) 270  $\Omega$  (B) 375  $\Omega$  (C) 450  $\Omega$  (D) 500  $\Omega$  (E) none of these



2. 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) 270  $\Omega$  (B) 375  $\Omega$  (C) 450  $\Omega$  (D) 500  $\Omega$  (E) none of these



3. The **DC noise margin (DCNM)** for the logic family described in Table 1 is:

(A) -0.7 V (B) -0.5 V (C) +0.5 V (D) +0.7 V (E) none of these

$$\text{DCNM} = \min(4.2 - 3.7, 1.2 - 0.5) = 0.5\text{ V}$$

4. The **practical fan-out** for the logic family described in Table 1 is:

(A) -800 (B) -600 (C) 600 (D) 800 (E) none of these

$$\text{Fanout} = \min\left(\frac{6}{0.01}, \frac{8}{0.01}\right) = 600$$

5. The **on resistance** of the **P-channel MOSFET** for the logic family described in Table 1 is approximately:

(A) 62.5  $\Omega$  (B) 133  $\Omega$  (C) 350  $\Omega$  (D) 700  $\Omega$  (E) none of these

$$\text{voltage drop} = 5 - 4.2 = 0.8\text{ V @ } 6\text{ mA} \quad R_{on} = \frac{0.8}{0.006} = 133$$

Signature: \_\_\_\_\_ E-mail: \_\_\_\_\_@purdue.edu