ECE3221 – Quiz # 1 **May 10, 2018** **Adam Wilson**

Name: SOLUTIONS **Student #:** _____ **Signature:** _____

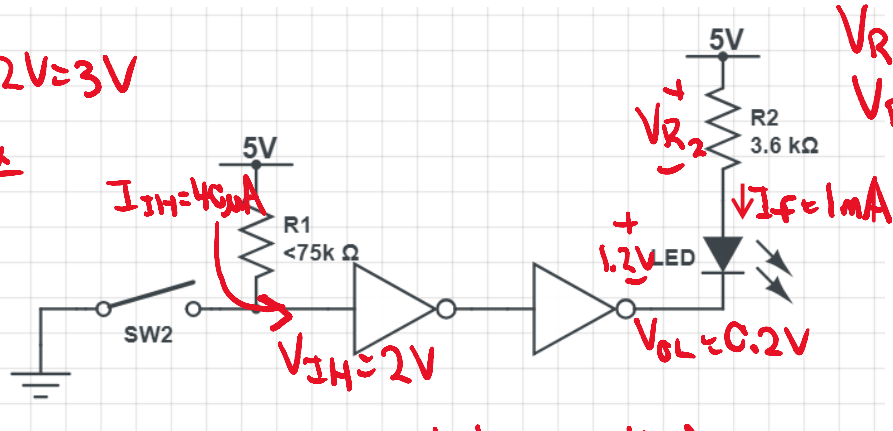
Calculators not allowed

1. (4 marks)

Complete the bitwise logical NOR of the two 16 bit values shown below and fill in the right hand columns with the equivalent hex value																	hex			
1	1	0	1	0	1	1	1	0	0	1	1	1	0	1	0	=	**D**	**7**	**3**	**A**
0	1	1	0	1	0	1	0	1	1	1	0	0	0	1	1	=	**6**	**A**	**E**	**3**
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	=	**0**	**0**	**0**	**4**

Complete the bitwise logical AND of the two 15 bit values shown below and fill in the right hand columns with the equivalent octal value																octal				
0	0	1	0	1	1	1	0	1	0	0	1	1	1	0	=	**1**	**3**	**5**	**1**	**6**
1	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	=	5	3	7	1	2
0	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	=	**1**	**3**	**5**	**1**	**2**

2. (4 marks) Use only as many inverters as required from a SN74LS04 hex inverter such that when: a SPST switch connected to an input of one of the inverters is closed, an LED connected to an output of one of the inverters turns on. A SN74LS04 hex inverter is an integrated circuit which contains 6 logic inverters (part of specification sheet is attached). The LED has a forward voltage drop of 1.2V and requires 1mA of forward current to be sufficiently bright in the on state. Power supply is 5V. **Bonus mark: Label appropriate resistance values of all resistors used.**



$V_{R_{max}} = 5V - 2V = 3V$

$R_{max} = \frac{V_{R_{max}}}{I_{IH}}$

$R_{max} = \frac{3V}{40\mu A}$

$R_{max} = 75k\Omega$

$R_1 \leq 75k\Omega$

LED must be pulled low to meet I_F requirements (I_{OL} = 16mA, I_{OH} = -0.4mA)

$V_{R_2} = 5V - 1.2V - 0.2V$

$V_{R_2} = 3.6V$

$R_2 = \frac{V_{R_2}}{I_F}$

$R_2 = \frac{3.6V}{1mA}$

$R_2 = 3.6k\Omega$

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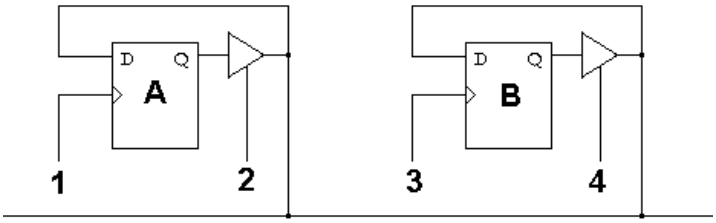
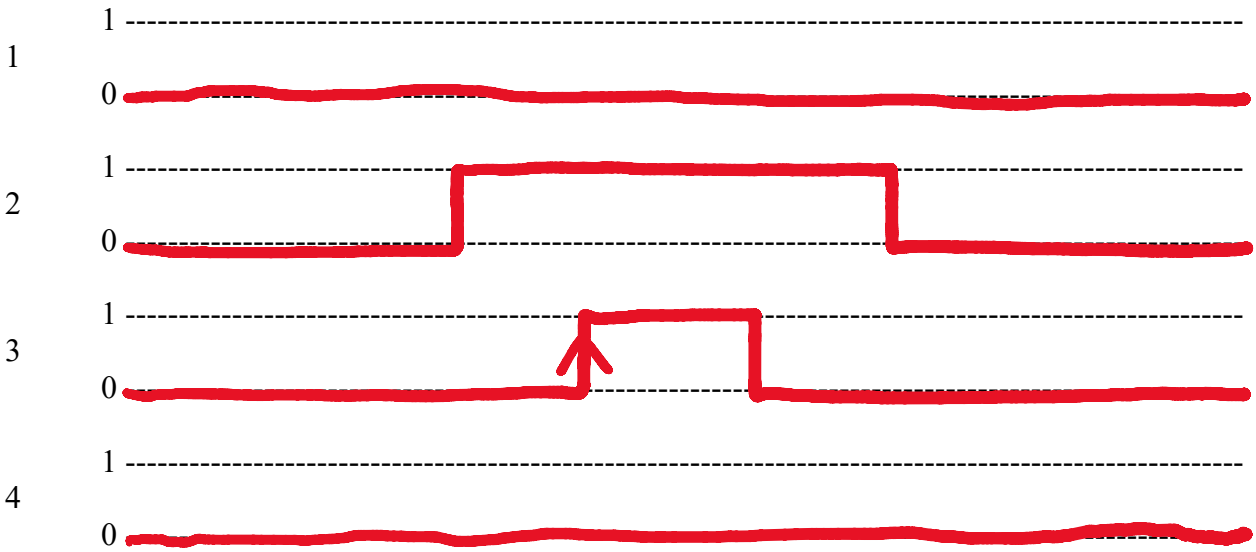
3. (4 marks) Draw a timing diagram showing the signals (1,2,3,4) as the value in **A** is copied to **B**. Assume all four signals levels are zero before and after the above operation.





The high signal (2) places the value from A onto the data bus (READ) and while it is still there, the signal (3) provides a clock signal (WRITE) such that the value on the data bus is copied into B. Only when this is done, the signal (2) may be lowered again.