



Digital Electronics™
Final Examination

Part B
High School Performance

Spring 2009

Student Name: _____

Date: _____

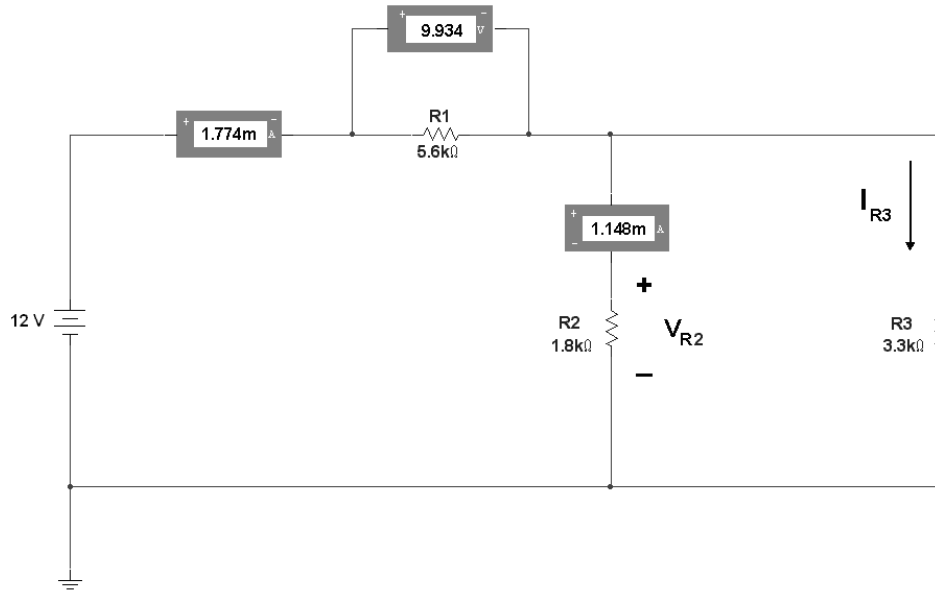
Class Period: _____

Total Points: _____/50

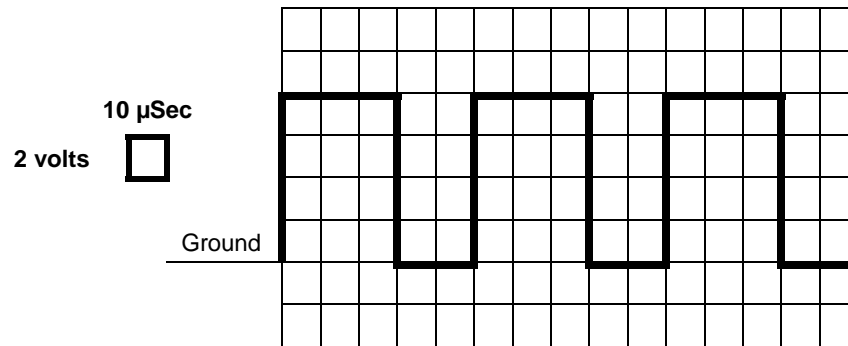
Short Answer - Design Problems

Directions: Complete all of the items. To receive full credit on any problem that requires calculations, you must 1) identify the formula, 2) show substitutions, and 3) state the answer with the correct units. Partial credit may be awarded.

- 1) Using the meter readings shown, calculate I_{R3} and V_{R3} using Kirchhoff's Current Law and Kirchhoff's Voltage Law. Be sure to use correct engineering notation and units. (Accuracy = 0.000)



- 2) For the square wave shown below, determine its (a) Period, (b) Frequency, (c) Duty Cycle, and (d) Amplitude. Be sure to show correct units.



A) Period = _____

B) Frequency = _____

C) Duty Cycle = _____

D) Amplitude = _____

3) Perform the indicated base conversions. **(Show each step, not just the answer.)**

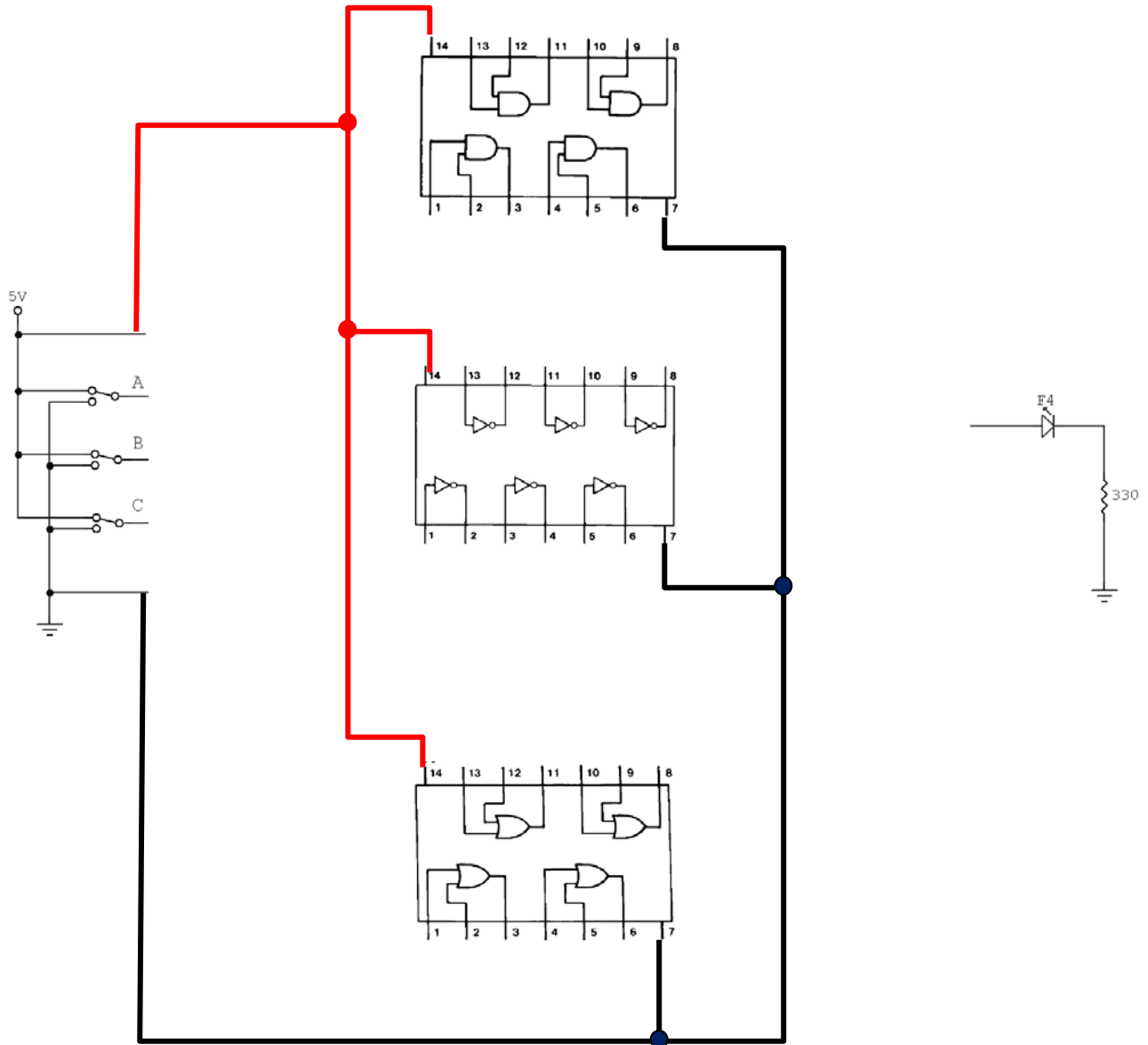
A) $100101_{(2)} = \underline{\hspace{2cm}}_{(10)}$

B) $59_{(10)} = \underline{\hspace{2cm}}_{(16)}$

C) $00101110_{(2)} = \underline{\hspace{2cm}}_{(16)}$

- 4) Using the chip block diagrams shown below, draw the wires to connect the gates to the input switches and output LED to implement the Boolean equation :

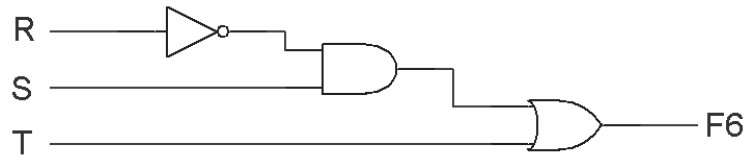
$$F_4 = A B + \bar{C}$$



- 5) Using the rules of Boolean algebra, including DeMorganizing, simplify the following expression. (**Show each step.**)

$$F_5 = \overline{\overline{X + \overline{Z}}} + \overline{X} Y Z$$

- 6) Using only two-input NOR gates, re-implement for the A-O-I circuit shown below using the fewest number of gates. (**Show each step.**)



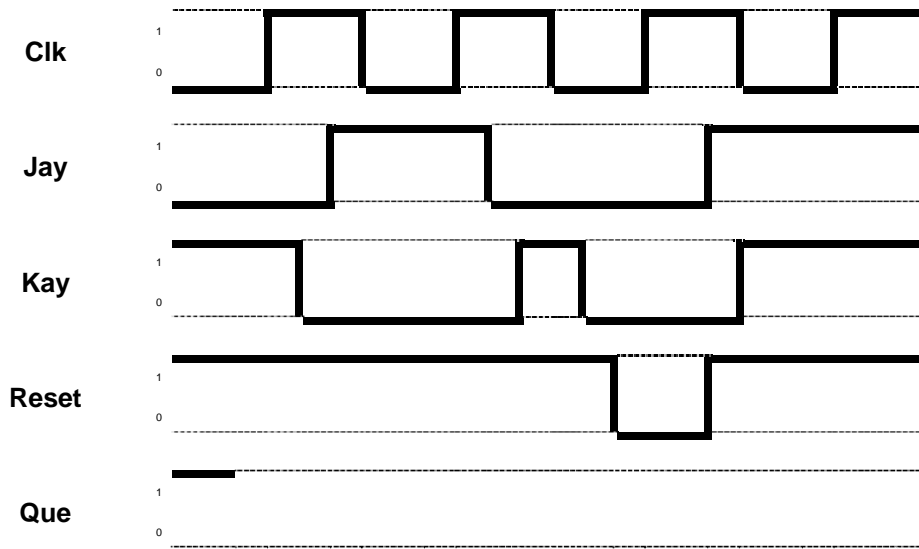
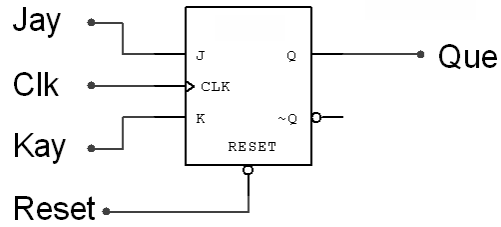
- 7) Using the K-Mapping technique, determine the simplest Sum-Of-Products Boolean equation for the truth table shown below.

A	B	C	F ₇
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	X
1	0	1	X
1	1	0	0
1	1	1	1

- 8) Using only two-input AND, two-input OR & logic inverters, draw the A-O-I implementation for the following Boolean expression.

$$F_8 = X \bar{Z} + W Y Z$$

9) For the J/K Flip-Flop shown below, sketch the waveform for signal QUE.



- 10) Using the incomplete, three-bit, asynchronous counter shown below as a starting point, design a counter that will display the binary numbers 6 through 2 in the logic displays. You may add any additional logic as needed.

