



Digital Electronics™

Final Examination

Part A

Spring 2009

Student Name: _____

Date: _____

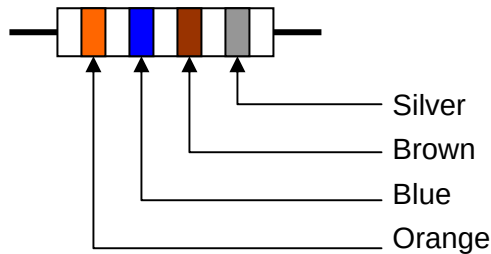
Class Period: _____

Total Points: _____/50

Converted Score: _____/40

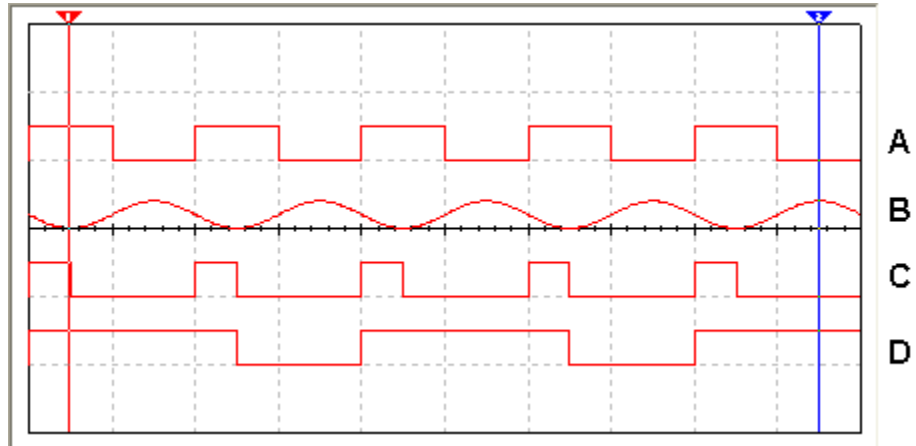
Directions: This is a **CLOSED BOOK/CLOSED NOTES** exam. Select the letter of the response which best completes the item or answers the question. Then record your answer on the answer sheet provided for Part A.

1. If an integrated circuit has been damaged and you smell smoke, you should _____.
 - A. leave the power on while pulling out the damaged integrated circuit.
 - B. turn the power off for a few minutes before pulling out the damaged integrated circuit.
 - C. push down on all the integrated circuits in the circuit with your finger.
 - D. turn up the power to twice the voltage before pulling out the damaged integrated circuit.
2. After reading a digital meter, a technician obtained a reading of 0.0073 volts. Which of the following numbers is the proper engineering notation for that number?
 - A. 7.3 m Volts
 - B. 7.3 μ Volts
 - C. 0.0073 μ Volts
 - D. 7.3 K Volts
3. What is the value of the resistor shown below?



- A. 160 K Ω ± 10 %
 - B. 360 Ω ± 5 %
 - C. 360 Ω ± 10 %
 - D. 36 K Ω ± 5 %
4. In a parallel circuit, you measure 1.5 mAmps flowing through a 600 Ω resistor. What is the voltage drop across the resistor?
 - A. 2.5 μ Volts
 - B. 900 m Volts
 - C. 400 m Volts
 - D. 0.900 m Volts
5. In a series circuit, you measure 9 volts across a 300 Ω resistor. How much current is flowing through the resistor?
 - A. 30 m Amps
 - B. 33.33 Amps
 - C. 300 m Amps
 - D. 3 m Amps

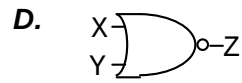
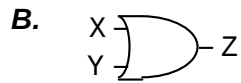
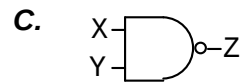
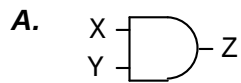
6. Which of the waveforms shown below is not a digital waveform?



- A. Waveform A
B. Waveform B
C. Waveform C
D. Waveform D
7. What is the binary equivalent to the decimal number 13_{10} ?
- A. 1101_2
B. 0111_2
C. 1011_2
D. 1001_2
8. What is the decimal equivalent to the binary number 010110_2 ?
- A. 13_{10}
B. 22_{10}
C. 23_{10}
D. 42_{10}
9. What is the binary equivalent to the hexadecimal number C_H ?
- A. 1000_2
B. 0110_2
C. 1001_2
D. 1100_2

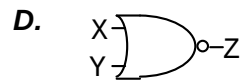
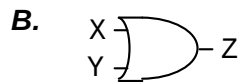
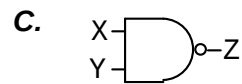
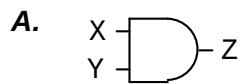
10. The truth-table shown below represents which of the following gates?

X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	1



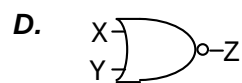
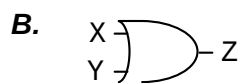
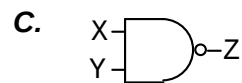
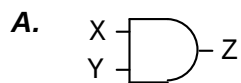
11. The truth-table shown below represents which of the following gates?

X	Y	Z
0	0	1
0	1	1
1	0	1
1	1	0

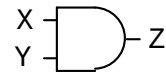


12. The truth-table shown below represents which of the following gates?

X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	0



13. The gate shown to the right is represented by which of the following truth-tables?



A.

X	Y	Z
0	0	0
0	1	0
1	0	0
1	1	1

C.

X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	1

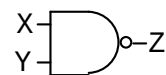
B.

X	Y	Z
0	0	1
0	1	1
1	0	1
1	1	0

D.

X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	0

14. The gate shown to the right is represented by which of the following truth-tables?



A.

X	Y	Z
0	0	0
0	1	0
1	0	0
1	1	1

C.

X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	1

B.

X	Y	Z
0	0	1
0	1	1
1	0	1
1	1	0

D.

X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	0

15. Which of the following is a rule of Boolean algebra?

A. $X \bullet \overline{X} = \overline{X}$

C. $X + \overline{X} = 0$

B. $X \bullet X = X$

D. $X + X = 1$

16. Which of the following is a rule of Boolean algebra?

A. $A + 1 = A$

C. $A + 1 = 1$

B. $A + 0 = 1$

D. $A + \overline{A} = 0$

17. Which of the following is the simplified equivalent for the Boolean equation shown?

$$F = \overline{Y} + X \overline{Y}$$

A. $F = X Y$

C. $F = X \overline{Y}$

B. $F = X$

D. $F = \overline{Y}$

18. Which of the following equations is the un-simplified Sum-Of-Products equation for the truth table shown?

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

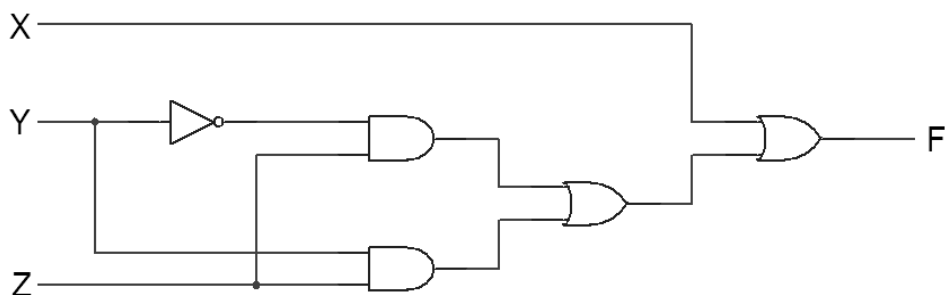
A. $F = \overline{X} \overline{Y} Z + \overline{X} Y \overline{Z} + X Y \overline{Z}$

C. $F = \overline{X} \overline{Y} Z + \overline{X} \overline{Y} \overline{Z} + X Y \overline{Z}$

B. $F = \overline{X} \overline{Y} Z + \overline{X} Y \overline{Z} + X \overline{Y} \overline{Z}$

D. $F = X \overline{Y} \overline{Z} + \overline{X} Y \overline{Z} + X Y \overline{Z}$

19. Which of the following un-simplified Boolean expressions represent the logic circuit shown below?



A. $F = X + \overline{Y} Z + \overline{Y} \overline{Z}$

C. $F = X + Y \overline{Z} + Y Z$

B. $F = X + \overline{Y} Z + Y Z$

D. $F = \overline{X} + \overline{Y} Z + Y Z$

20. Which of the following is a correct DeMorgan's Identity?

A. $\overline{X \bullet Y} = \overline{X} \bullet \overline{Y}$

C. $\overline{X \bullet Y} = \overline{X} + \overline{Y}$

B. $\overline{X \bullet Y} = X \bullet Y$

D. $\overline{X \bullet Y} = X + Y$

21. Which of the following is the simplified equivalent for the Boolean equation shown?

$$F = \overline{X + \overline{Y}}$$

A. $F = \overline{X} Y$

C. $F = X \overline{Y}$

B. $F = X + \overline{Y}$

D. $F = \overline{X} \overline{Y}$

22. Which of the following K-Maps has the 1's & 0's properly placed for the function F_{20} ?

W	X	Y	Z	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

A.

	$\overline{W}\overline{X}$	$\overline{W}X$	WX	$W\overline{X}$
$\overline{Y}\overline{Z}$	0	0	1	1
$\overline{Y}Z$	0	1	0	1
YZ	1	1	0	0
$Y\overline{Z}$	0	0	1	0

C.

	$\overline{W}\overline{X}$	$\overline{W}X$	WX	$W\overline{X}$
$\overline{Y}\overline{Z}$	0	0	1	0
$\overline{Y}Z$	0	1	1	0
YZ	1	0	0	1
$Y\overline{Z}$	1	1	0	0

B.

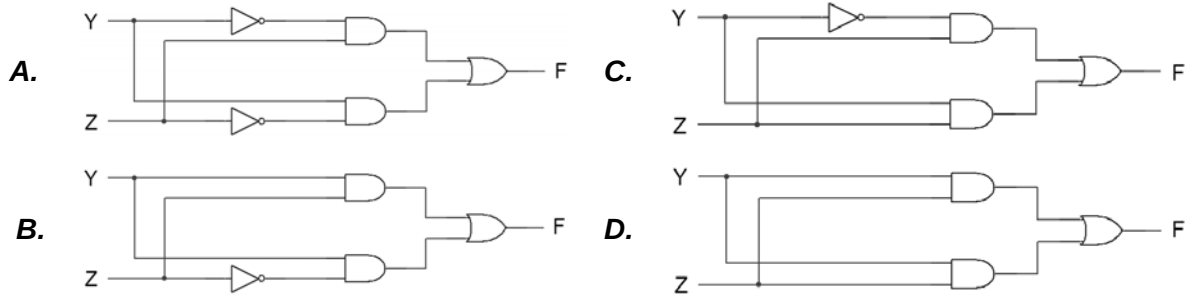
	$\overline{W}\overline{X}$	$\overline{W}X$	WX	$W\overline{X}$
$\overline{Y}\overline{Z}$	0	0	0	1
$\overline{Y}Z$	0	1	0	1
YZ	1	1	0	0
$Y\overline{Z}$	1	0	1	0

D.

	$\overline{W}\overline{X}$	$\overline{W}X$	WX	$W\overline{X}$
$\overline{Y}\overline{Z}$	0	0	0	1
$\overline{Y}Z$	0	1	0	1
YZ	1	0	1	0
$Y\overline{Z}$	1	1	0	0

23. Which of the following logic circuits correctly implements the Boolean equation?

$$F = \overline{Y} Z + Y \overline{Z}$$



24. Which of the following K-maps is grouped properly and will result in the simplest solution?

	$\overline{X}\overline{Y}$	$\overline{X}Y$	XY	$X\overline{Y}$
A. $\overline{Z}$	1	0	X	0
Z	1	X	X	1

	$\overline{X}\overline{Y}$	$\overline{X}Y$	XY	$X\overline{Y}$
C. $\overline{Z}$	1	0	X	0
Z	1	X	X	1

	$\overline{X}\overline{Y}$	$\overline{X}Y$	XY	$X\overline{Y}$
B. $\overline{Z}$	1	0	X	0
Z	1	X	X	1

	$\overline{X}\overline{Y}$	$\overline{X}Y$	XY	$X\overline{Y}$
D. $\overline{Z}$	1	0	X	0
Z	1	X	X	1

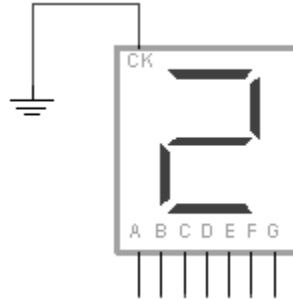
25. Which Boolean equation is in Product-Of-Sums form?

- A.** $F = X Y \overline{Z} + X \overline{Y} + X Y Z$ **C.** $F = (X + Y)(X + Z)(\overline{Y} + Z)$
- B.** $F = X \overline{Y} \overline{Z} + Z(X + Y)$ **D.** $F = X Z (Y + Z)(\overline{Y} + Z)$

26. Which of the following Boolean equation is in Sum-Of-Products form?

- A.** $F = A \overline{B} C + \overline{A} B \overline{C} + A \overline{C}$ **C.** $F = (\overline{A} + B + \overline{C})(\overline{A} + C)(A + \overline{B} + C)$
- B.** $F = \overline{A} B C + A (\overline{B} + C)$ **D.** $F = \overline{A} (B + C) + A (\overline{B} + C)$

27. What logic values need to be placed on the inputs (a) through (g) of the common-cathode seven segment in order to display the number 2?



A.

A	B	C	D	E	F	G
1	1	0	1	1	0	1

C.

A	B	C	D	E	F	G
1	0	1	1	0	1	1

B.

A	B	C	D	E	F	G
0	0	1	0	0	1	0

D.

A	B	C	D	E	F	G
0	1	1	0	0	1	0

28. The gate shown below is represented by which of the following truth-tables?



A.

X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	1

C.

X	Y	Z
0	0	1
0	1	0
1	0	1
1	1	0

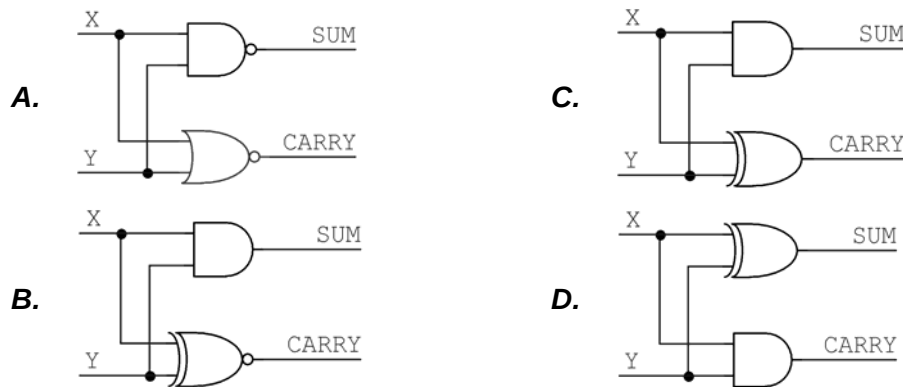
B.

X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	0

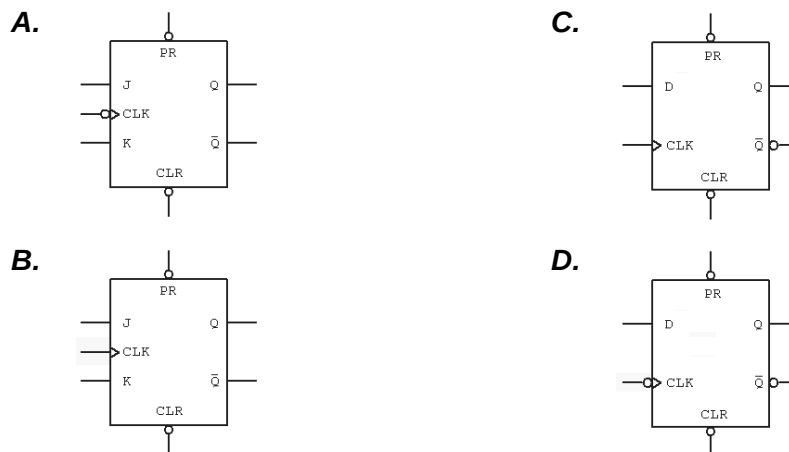
D.

X	Y	Z
0	0	0
0	1	1
1	0	0
1	1	1

29. Which of the following circuits is a half-adder?



30. Which of the devices shown below is a Negative Edge Triggered D flip-flop?



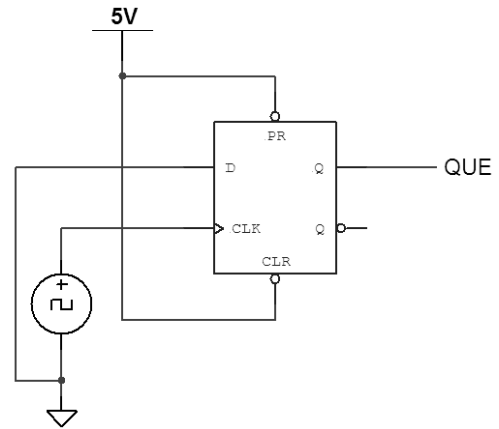
31. How are the Q and $\bar{Q}$ outputs of a flip flop affected by setting the active high asynchronous PRESET input to a logic one?

- A.** No change. **C.** $Q = 0$ and $\bar{Q} = 1$
- B.** $Q = 1$ and $\bar{Q} = 0$ **D.** $Q = 1$ and $\bar{Q} = 1$

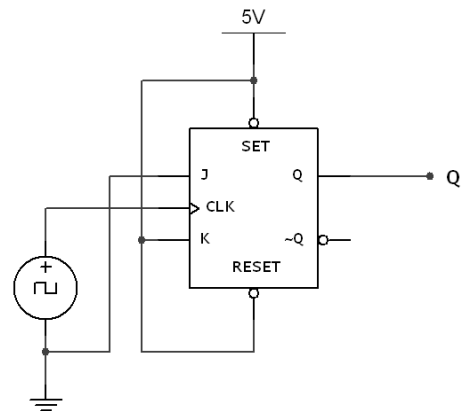
32. How are the Q and $\bar{Q}$ outputs of a flip flop affected by setting the active low asynchronous CLEAR input to a logic zero?

- A.** No change. **C.** $Q = 0$ and $\bar{Q} = 1$
- B.** $Q = 1$ and $\bar{Q} = 0$ **D.** $Q = 1$ and $\bar{Q} = 1$

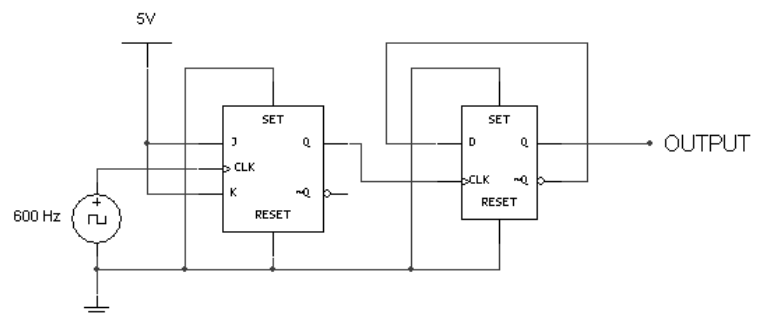
33. Regardless of its current value, what will happen to the output **QUE** on the next clock pulse?



- A. QUE will be low.
 B. QUE will be high.
 C. QUE will toggle.
 D. QUE will not change.
34. For the single flip-flop shown below, what will the output Q be on the next clock pulse?



- A. Q will be high.
 B. Q will be low.
 C. Q will toggle.
 D. Q will not change.
35. Determine the output frequency for the circuit shown to the right.



- A. 150 Hz.
 B. 600 Hz.
 C. 300 Hz.
 D. 450 Hz.

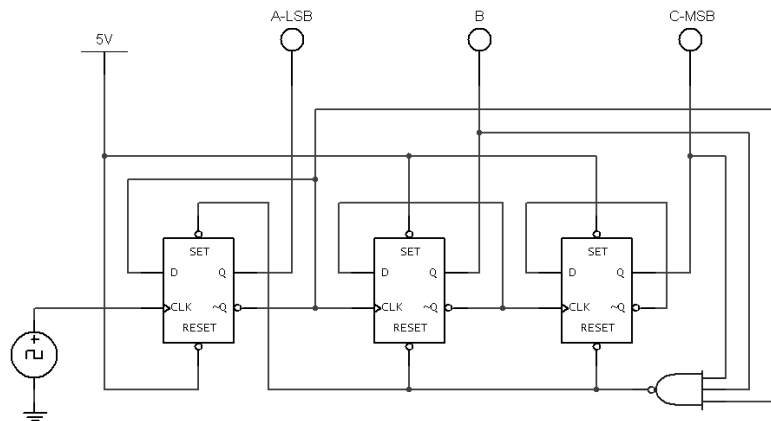
36. What is the minimum number of flip-flops needed to build a Mod-10 Asynchronous counter?

- A. 3
- B. 5
- C. 4
- D. 10

37. Which of the following statements applies to asynchronous counters?

- A. Asynchronous counters are faster than synchronous counters.
- B. Asynchronous counters require more power than synchronous counters.
- C. All the flip-flops in an Asynchronous counter are clocked at the same time by a common external clock.
- D. Asynchronous counters are also called ripple counters.

38. What is the count range of the 3-bit asynchronous shown to the right?



- A. 1 to 6
- B. 6 down to 11
- C. 1 to 5
- D. 5 down to 1

39. When comparing TTL logic gates to CMOS gates, which of the following statements is true?

- A. CMOS gates use more power than TTL gates.
- B. CMOS gates are faster than TTL gates.
- C. CMOS gates are more sensitive to static electricity than TTL gates.
- D. CMOS gates have a lower margin than TTL gates.

40. Propagation delay is _____.

- A.** a measure of the ability of a logic gate to drive further logic gates.
- B.** the difference in chip temperature from when the power is off to when the power is on.
- C.** the difference between what a logic gate outputs as a valid logic voltage and what the input of the next gates expects to see as a valid logic voltage.
- D.** the time required for a signal to travel from the input of a logic gate to the output.