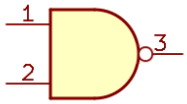
CSCI 463 – Midterm (Fall 2019)

Name: _____ Z-number: _____

Each question has one and only one correct answer. Choose the best possible/most accurate answer for each question.

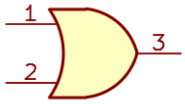
All answers must be given in the context of the lectures and assignments used in the course.

1. What function does this symbol represent?



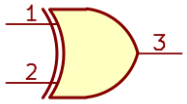
Ⓐ AND, Ⓑ NAND, Ⓒ OR, Ⓓ NOT, Ⓔ XOR

2. What function does this symbol represent?



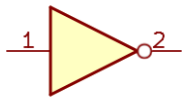
Ⓐ AND, Ⓑ NAND, Ⓒ OR, Ⓓ NOT, Ⓔ XOR

3. What function does this symbol represent?



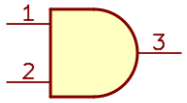
Ⓐ AND, Ⓑ NAND, Ⓒ OR, Ⓓ NOT, Ⓔ XOR

4. What function does this symbol represent?



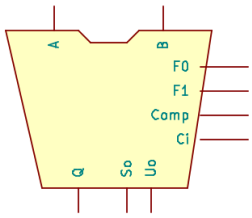
Ⓐ AND, Ⓑ NAND, Ⓒ OR, Ⓓ NOT, Ⓔ XOR

5. What function does this symbol represent?



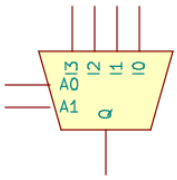
Ⓐ AND, Ⓑ NAND, Ⓒ OR, Ⓓ NOT, Ⓔ XOR

6. What function does this symbol represent?



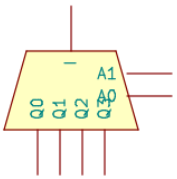
Ⓐ D-latch, Ⓑ Demultiplexer, Ⓒ ALU, Ⓓ Multiplexer, Ⓔ Register

7. What function does this symbol represent?



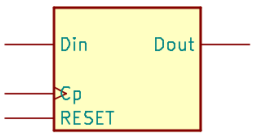
Ⓐ D-latch, Ⓑ Demultiplexer, Ⓒ ALU, Ⓓ Multiplexer, Ⓔ Register

8. What function does this symbol represent?



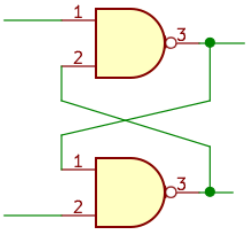
Ⓐ D-latch, Ⓑ Demultiplexer, Ⓒ ALU, Ⓓ Multiplexer, Ⓔ Register

9. What function does this symbol represent?



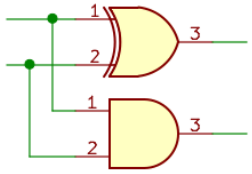
Ⓐ D-latch, Ⓑ RS-latch, Ⓒ ALU, Ⓓ Full Adder, Ⓔ Half adder

10. What is the following circuit?



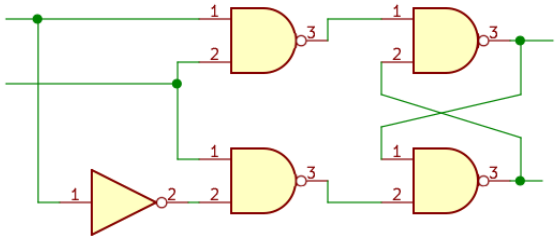
Ⓐ D-latch, Ⓑ RS-latch, Ⓒ ALU, Ⓓ Full Adder, Ⓔ Half adder

11. What is the following circuit?



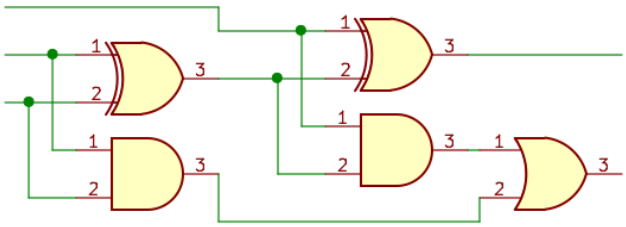
Ⓐ D-latch, Ⓑ RS-latch, Ⓒ ALU, Ⓓ Full Adder, Ⓔ Half adder

12. What is the following circuit?



Ⓐ D-latch, Ⓑ RS-latch, Ⓒ ALU, Ⓓ Full Adder, Ⓔ Half adder

13. What is the following circuit?



Ⓐ D-latch, Ⓑ RS-latch, Ⓒ ALU, Ⓓ Full Adder, Ⓔ Half adder

14. Which is the truth table for the XOR function?

Ⓐ			Ⓑ			Ⓒ			Ⓓ			Ⓔ		
A	B	Q	A	B	Q	A	B	Q	A	B	Q	A	B	Q
1	1	1	0	0	0	0	0	1	0	0	0	0	0	0
0	1	1	0	1	1	0	1	1	0	1	1	0	1	0
1	0	1	1	0	1	1	0	1	1	0	1	1	0	0
1	1	0	1	1	1	1	1	0	1	1	0	1	1	1

15. Which is the truth table for the OR function?

Ⓐ			Ⓑ			Ⓒ			Ⓓ			Ⓔ		
A	B	Q	A	B	Q	A	B	Q	A	B	Q	A	B	Q
1	1	1	0	0	0	0	0	1	0	0	0	0	0	0
0	1	1	0	1	1	0	1	1	0	1	1	0	1	0
1	0	1	1	0	1	1	0	1	1	0	1	1	0	0
1	1	0	1	1	1	1	1	0	1	1	0	1	1	1

16. Which is the truth table for the NAND function?

Ⓐ

A	B	Q
1	1	1
0	1	1
1	0	1
1	1	0

Ⓑ

A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

Ⓒ

A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

Ⓓ

A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

Ⓔ

A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

17. What is the clock input used for in those circuits that have one?

Ⓐ To tell time,
Ⓑ To determine when to change its state,
Ⓒ To determine when to change its input,
Ⓓ To disable the output,
Ⓔ To store the demultiplexer output in the ALU

18. Which is the truth table for a full-adder?

Ⓐ

A	B	Co	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

Ⓑ

A	B	Ci	Co	S
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	1	0
1	0	0	0	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

Ⓒ

A	B	Ci	Co	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

Ⓓ

A	B	Ci	Co	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	1	1	1	0
1	1	1	1	0
1	1	1	1	1

Ⓔ

A	B	Ci	Co	S
0	0	0	1	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	0
1	0	0	1	1
1	0	1	0	0
1	1	0	0	0
1	1	1	0	1

19. Which is the truth table for a half-adder?

Ⓐ

A	B	Co	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

Ⓑ

A	B	Ci	Co	S
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	1	0
1	0	0	0	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

Ⓒ

A	B	Ci	Co	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

Ⓓ

A	B	Ci	Co	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	1	1	1	0
1	1	1	1	0
1	1	1	1	1

Ⓔ

A	B	Ci	Co	S
0	0	0	1	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	0
1	0	0	1	1
1	0	1	0	0
1	1	0	0	0
1	1	1	0	1

20. What is the LSB of the decimal number 1234?

Ⓐ 0, Ⓑ 1, Ⓒ 2, Ⓓ 3, Ⓔ 4

21. What is the LSB of the decimal number 123?

Ⓐ 0, Ⓑ 1, Ⓒ 2, Ⓓ 3, Ⓔ 4

22. What do the signals labeled I0-In do on a multiplexer?

Ⓐ Data inputs, Ⓑ Data outputs, Ⓒ Address inputs, Ⓓ Address outputs, Ⓔ Clock signals

23. What are signals labeled A0-An called on a multiplexer?

Ⓐ Data inputs, Ⓑ Data outputs, Ⓒ Address inputs, Ⓓ Address outputs, Ⓔ Clock signals

24. What do the signals labeled A0-An do on a multiplexer?

Ⓐ Select which output to enable,
Ⓑ Select which input to propagate,
Ⓒ Select which output to disable,
Ⓓ Select which input to disable,
Ⓔ Select which boolean function to perform

25. Which signals on a demultiplexer are its inputs?

Ⓐ A0-An Ⓑ I0-In Ⓒ Q0-Qn Ⓓ Both A and B Ⓔ Both A and C

26. Which signals on a demultiplexer are its outputs?

Ⓐ A0-An Ⓑ I0-In Ⓒ Q0-Qn Ⓓ Both A and B Ⓔ Both A and C

27. What do the signals labeled F0-Fn do on an ALU?

Ⓐ Select which output to enable,
Ⓑ Select which input to propagate,
Ⓒ Select which arithmetic operation to perform,
Ⓓ Select which logical operation to perform,
Ⓔ Both C and D

28. Which circuit can add these two binary numbers: 1101 1100

Ⓐ RS-latch, Ⓑ Demultiplexer, Ⓒ ALU, Ⓓ Full Adder, Ⓔ Half adder

29. How many full adders are needed to add two signed 8 bit numbers?

Ⓐ 1, Ⓑ 2, Ⓒ 4, Ⓓ 8, Ⓔ 16

30. What types of clocks are used for registers?

Ⓐ RS, Ⓑ Level, Ⓒ Edge, Ⓓ Boolean, Ⓔ GPS

31. What is an RS latch used for?

Ⓐ To reset the ALU,
Ⓑ To store one bit,
Ⓒ To store two bits,
Ⓓ To generate the overflow status,
Ⓔ To trigger the Multiplexer

32. What is a bus?

Ⓐ A register,
Ⓑ To store one bit,
Ⓒ To store two bits,
Ⓓ A collection of related signals,
Ⓔ A collection of unrelated signals

33. Which of the following is true?

Ⓐ High-level-sensitive latches will retain the input present during the falling edge of the enable signal,
Ⓑ High-level-sensitive latches allow the output to change multiple times when the enable signal is high,
Ⓒ Falling-edge-triggered latches retain the input when the clock changes from `1` to `0`,
Ⓓ All of the above
Ⓔ None of the above

The following waveform includes, among other things, the signals of an RS latch whose output is labeled Q:

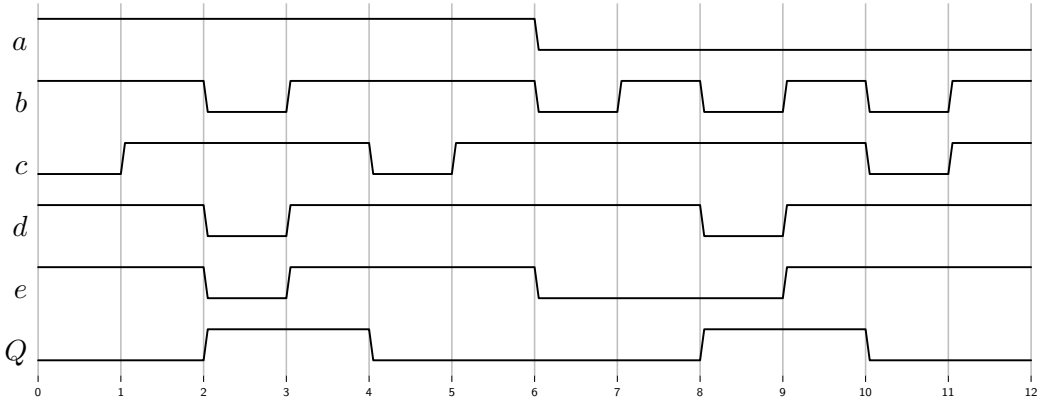


Figure 1: A Timing Diagram

34. Which signal labeled *a*-*e* in Figure 1 is the *reset* signal?

35. Which signal labeled *a*-*e* in Figure 1 is the *set* signal?

36. What does overflow mean?

Ⓐ A carry out of the LSB,
Ⓑ A carry into the MSB,
Ⓒ An operation can not fit into the destination register,
Ⓓ A logical operation has no inputs,
Ⓔ A collection of related signals

37. What signifies that an *unsigned* overflow has taken place during an addition?

Ⓐ A carry out of the LSB,
Ⓑ A carry into the MSB,
Ⓒ A carry out of the MSB,
Ⓓ A carry into the LSB that is is different from the carry out of the LSB,
Ⓔ A carry into the MSB that is is different from the carry out of the MSB

38. What signifies that a *signed* overflow has taken place during an addition?

Ⓐ A carry out of the LSB,
Ⓑ A carry into the MSB,
Ⓒ A carry out of the MSB,
Ⓓ A carry into the LSB that is is different from the carry out of the LSB,
Ⓔ A carry into the MSB that is is different from the carry out of the MSB

39. What the hexadecimal value of the binary number 10110001?

Ⓐ 69, Ⓑ C0, Ⓒ 19, Ⓓ C2, Ⓔ B1

40. What the hexadecimal value of the binary number 01101001?

Ⓐ 69, Ⓑ C0, Ⓒ 19, Ⓓ C2, Ⓔ B1

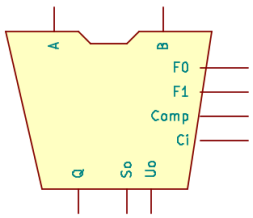
41. What the binary value of the hexadecimal number 22?

Ⓐ 10101010, Ⓑ 11110000, Ⓒ 00000000, Ⓓ 10100101, Ⓔ 00100010

42. What the binary value of the hexadecimal number A5?

Ⓐ 10101010, Ⓑ 11110000, Ⓒ 00000000, Ⓓ 10100101, Ⓔ 00100010

Given the following schematic symbol (that matches that discussed lecture), truth table and waveform diagram (labeled such that time t_0 appears at the far left edge and t_{16} appears at the right):



F0	F1	Q
0	0	Sum/Diff
0	1	$A \oplus B$
1	0	$A + B$
1	1	$A \cdot B$

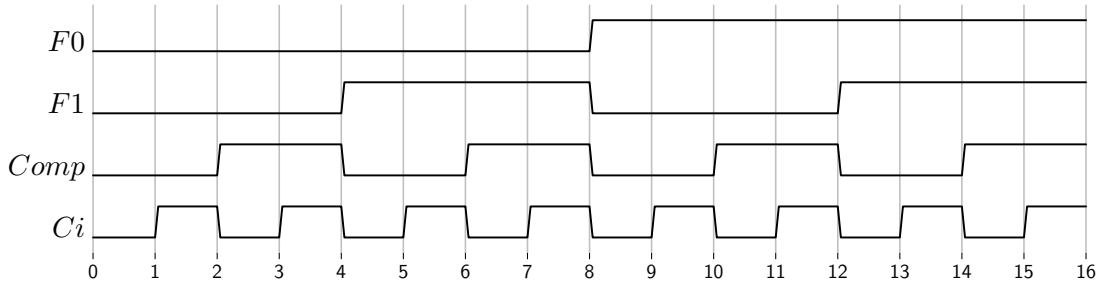


Figure 2: A Timing Diagram

43. What function is being performed between time t_0 and t_1?
Ⓐ Add, Ⓑ Subtract, Ⓒ XOR, Ⓓ OR, Ⓔ AND

44. What function is being performed between time t_3 and t_4?
Ⓐ Add, Ⓑ Subtract, Ⓒ XOR, Ⓓ OR, Ⓔ AND

45. What function is being performed between time t_4 and t_5?
Ⓐ Add, Ⓑ Subtract, Ⓒ XOR, Ⓓ OR, Ⓔ AND

46. What function is being performed between time t_8 and t_9?
Ⓐ Add, Ⓑ Subtract, Ⓒ XOR, Ⓓ OR, Ⓔ AND

47. What function is being performed between time t_{12} and t_{13}?
Ⓐ Add, Ⓑ Subtract, Ⓒ XOR, Ⓓ OR, Ⓔ AND

48. What function is being performed between time t_{13} and t_{14}?
Ⓐ Add, Ⓑ Subtract, Ⓒ XOR, Ⓓ OR, Ⓔ AND

49. What function is being performed between time t_5 and t_6?
Ⓐ $A \oplus B$, Ⓑ $\overline{A} \cdot B$, Ⓒ $A \cdot B$, Ⓓ $A \cdot \overline{B}$, Ⓔ $A + \overline{B}$

50. What function is being performed between time t_{14} and t_{15}?
Ⓐ $A \oplus B$, Ⓑ $\overline{A} \cdot B$, Ⓒ $A \cdot B$, Ⓓ $A \cdot \overline{B}$, Ⓔ $A + \overline{B}$