Assignment 3
(**Due date: 10/2/2009, Friday, in class**)

Your name:	Grade:

Important notice on how to submit and grade this assignment:

- Write your answers on **different papers** from the question sheets; otherwise, they will **NOT** be graded.
- You do **NOT** have to write the question text, but you need to **write the question number** for each question.
- Put your solutions in the **same order** as the questions appear on the assignment; otherwise, **missed or misplaced** solutions will **NOT** be graded.
- **How to Grade:**
  - The total score for the assignment is **100** points.
  - **An extra 8%** will be added to the **TYPEWRITTEN** submissions.
  - **3 points will be deducted** from your total score if you **missed any ONE** of the following (this is a *cumulative penalty*, e.g., 9 points will be taken for 1 missed name and 2 missed required blank lines):
    - **Your name** and **assignment number** on the top of each solution sheet/paper,
    - At least **one blank line** between solutions of adjacent questions (**except for** those of *Multiple Choice* or *True/False* questions).

The following questions are taken from the textbook Chapter 4 (p. 112-117).

- **For questions 18 through 29, using A, B, C, D, E, or F as your answers** for each of these questions (you may write text solutions alongside these A, B, …F). **50%** will be deducted if your solutions are **NOT** one of these A, B, …F (even though your texts give the correct answers).
- Do **NOT** use any calculators for the conversion/calculation questions.

- For Exercises **1–17**, mark the answers **true** or **false** (**T** or **F**)

1. Logic diagrams and truth tables are equally powerful in expressing the processing of gates and circuits.

2. Boolean expressions are more powerful than logic diagrams inexpressing the processing of gates and circuits.

3. A NOT gate accepts two inputs.

4. The output value of an AND gate is 1 when both inputs are 1.

5. The AND and OR gates produce opposite results for the same input.

6. The output value of an OR gate is 1 when both inputs are 1.

7. The output of an OR gate when one input is 0 and one input is 1 is 0.

8. The output value of an XOR gate is 0 unless both inputs are 1.

9. The NOR gate produces the opposite results of the XOR gate.

10. A gate can be designed to accept more than two inputs.

11. A transistor is made of semiconductor material.

12. Inverting the output of an AND gate is equivalent to inverting the individual signals first, then passing them through an OR gate.

13. The sum of two binary digits (ignoring the carry) is expressed by an AND gate.

14. A full adder takes the carry-in value into account.

15. A multiplexer adds all of the bits on its input lines to produce its output.

16. Integrated circuits are classified by the number of gates contained in them.

17. A CPU is an integrated circuit.

- For Exercises **18–29**, match the gate with the description of the operation or the diagram.

A. AND
B. NAND
C. XOR
D. OR
E. NOR
F. NOT

18. Inverts its input.

19. Produces a 1 only if all its inputs are 1 and a 0 otherwise.

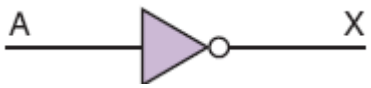
20. Produces a 0 only if all its inputs are 0 and a 1 otherwise.

21. Produces a 0 only of its inputs are the same and a 1 otherwise.

22. Produces a 0 if all its inputs are all 1 and a 1 otherwise.

23. Produces a 1 if all its inputs are 0 and a 0 otherwise.

24.



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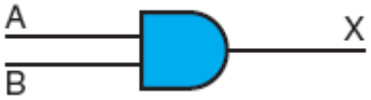

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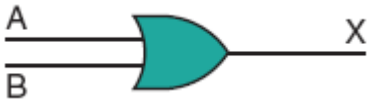

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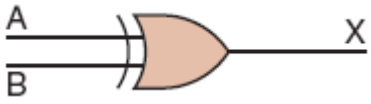

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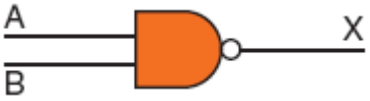

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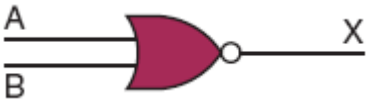


- **30**. How is voltage level used to distinguish between binary digits?
- **32**. What are the three notational methods for describing the behavior of gates and circuits?
- **34**. How many input signals can a gate receive, and how many output signals can a gate produce?
- **37**. Give the three representations of an AND gate and say in words what AND means.
- **39**. Give the three representations of an XOR gate and say in words what XOR means.
- **43**. Give the Boolean expression for a three input AND gate, then show its behavior with a truth table.
- **44**. Give the Boolean expression for a three-input OR gate, then show its behavior with a truth table.
- **54.** What are the two general categories of circuits and how do they differ?

- **55**. Draw a circuit diagram corresponding to the following Boolean expression:

  (A + B)(B + C)

- **56**. Draw a circuit diagram corresponding to the following Boolean expression:

  (AB + C)D

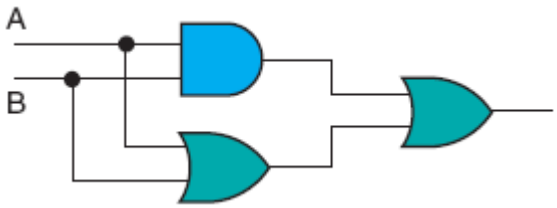
- **57**. Draw a circuit diagram corresponding to the following Boolean expression:

  A'B + (B+C)'.

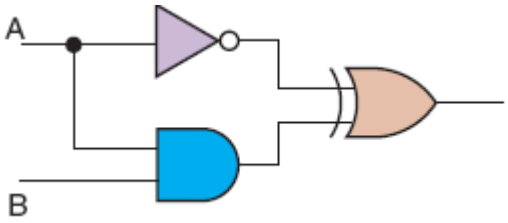
- **58**. Draw a circuit diagram corresponding to the following Boolean expression:

  (AB)' + (CD)'

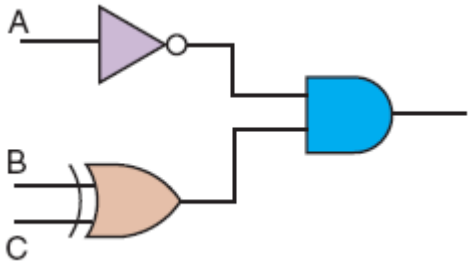
- **59**. Show the behavior of the following circuit with a truth table:



- **60**. Show the behavior of the following circuit with a truth table:



- **61**. Show the behavior of the following circuit with a truth table:



- **65**. Differentiate between a half adder and a full adder.

- **69**. What is an integrated circuit or chip?