BEFORE READING

Answer these questions:

- What is a logic gate?
- How many elementary gate types do you know of?
- What is meant by "compound gates"?
- How many compound gates do you know of?

WHILE READING

The text below is divided into two parts: in the first part there are five main paragraphs; give a title to each of them. One is already given for you.
In the second part of the text you will be asked to write the missing information.

1. What a logic gate is.

2. ....

3. ....

4. ....

5. ....

LOGIC GATES

1. The basic building blocks that make up all digital systems are simple little circuits called logic gates. A logic gate is a decision-making building block which has one output and two or more inputs as shown in Figure 1.

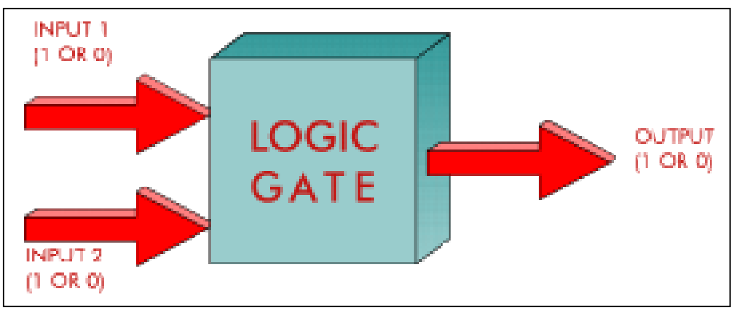


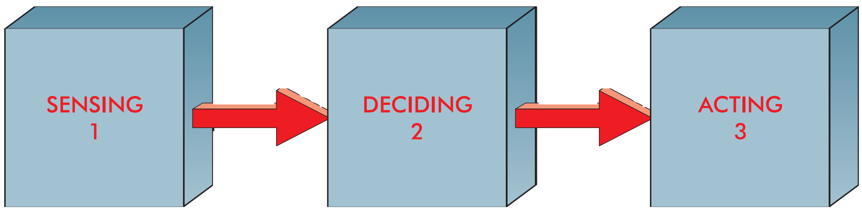
Figure 1

2. The input and output signals of a gate can have either of two values, binary 1 or 0. The value of the output of a gate is decided by the values of its inputs. The truth table for a logic gate shows the value of the output for all possible values of the inputs. AND and OR gates (and the other gates described below) are known as logic gates because their outputs are the logical (i.e. predictable) result of a particular combination of input states.

3. Logic gates are used in computer, control and communications systems, and especially in calculators and digital watches. Figure 2 shows the usual place of logic gates in digital systems. They have the intermediate task of receiving signals from sensors, making decisions based on the information received, and sending an output signal to a circuit which provides some action, such as switching on a motor.

Figure 2

The function of a digital system: logic gates are used in building block 2



4. Though decision-making building blocks in digital systems can be designed using individual diodes and transistors, or even mechanical switches, most digital circuits now make use of logic gates in integrated circuit packages. There are two main "families" of these digital ICs; one is called transistor-transistor logic (TTL), and the other complementary metal-oxide semiconductor logic (CMOS).

5. Two alternative systems are in use for showing the symbols of logic gates in circuit diagrams, the American "Mil Spec" system and the British Standards system. Figure 3 summarises these symbols for six logic gates, the AND, OR, NOT, NAND, NOR and Exclusive-OR gates.
The American "Mil Spec" symbols are widely preferred, since their different shapes are easily recognised in complex circuit diagrams.

Now, look carefully at Figure 3 and then complete the following text with the missing output values:

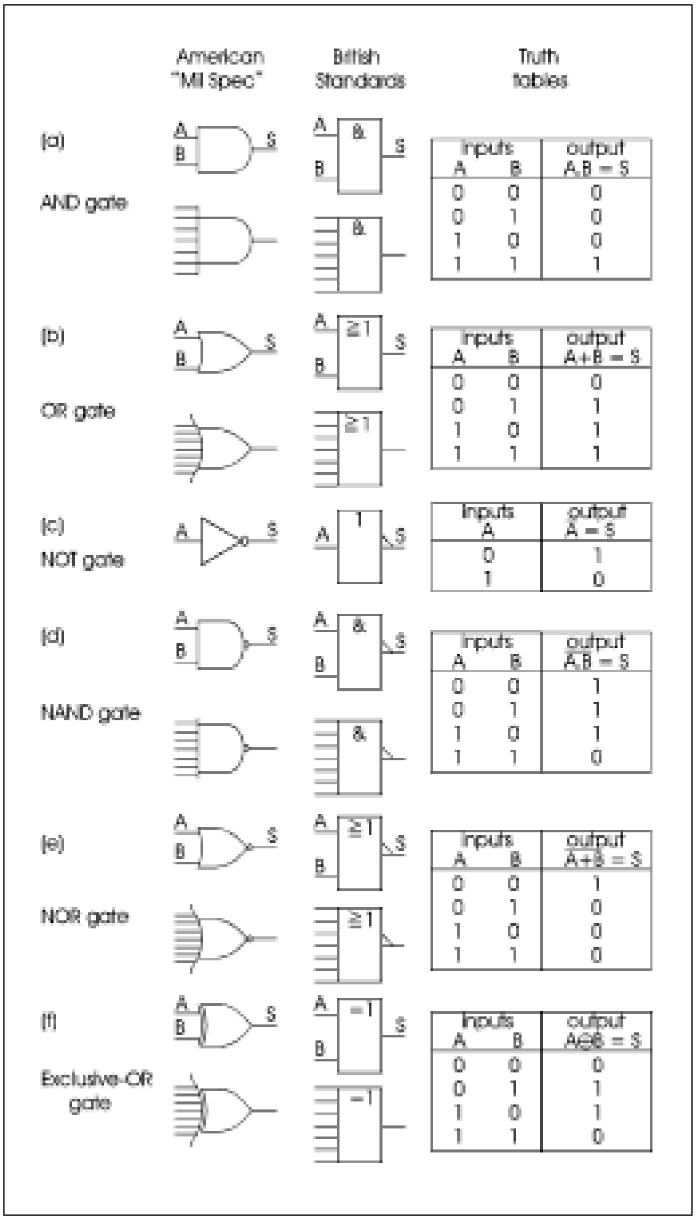


Figure 3

6. The AND gate gives an output of logic .... when all inputs are at logic 1, and an output of logic .... if any or all inputs are at logic 0. Thus an AND gate is sometimes called an "all-or-nothing gate".

For the 2-input gate shown in Figure 3a, the output, S, is at logic .... only when input A and input B are at logic 1.

The truth table for the 2-input AND gate gives the state of the output, S, for all combinations of input states - hence the term "combinational logic" is used to describe logic systems using gates like the AND gate.

7. For the 2-input OR gate shown in Figure 3b, the output, S, is at logic .... when either input A or input B, or both inputs, are at logic 1. Thus the OR gate is sometimes called an "any-or-all gate". The truth table for the 2-input OR gate gives the state of the output, S, for all combinations of input states.

8. For the NOT gate shown in Figure 3c, the output, S, is simply the inverse of the input A. Thus, if the state of the input is logic 1, the output state is logic .... and vice versa. For this reason the NOT gate is also called an inverter. The truth table for the NOT gate is simple - it has only two lines.

9. The NAND (or NOT-AND) gate gives an output which is the converse of the AND gate. Thus for the 2-input NAND gate shown in Figure 3d, the output, S, is at logic .... when either input A or input B, or both inputs, are at logic 0.

The truth table for the 2-input NAND gate gives the state of the output, S, for all combinations of input states. Compare it with the truth table of the AND gate.

10. The NOR (or NOT-OR) gate gives an output which is the converse of the OR gate. Thus for the 2-input NOR gate shown in Figure 3e, the output, S, is at logic .... when either input A or input B, or both inputs, are at logic 1.

The truth table for the 2-input NOR gate gives the state of the output, S, for all combinations of input states.

11. The 2-input Exclusive-OR (or XOR) gate shown in Figure 3f does something that the OR gate of Figure 3b does not: it is a true OR gate for it only gives an output of logic .... when either, but not both, of its inputs are at logic 1.

The truth table summarises the action of the XOR gate which you should compare with that for the OR gate.

AFTER READING

CONTENT

Correct the following statements; there is a technical mistake in each of them.

1. The output of a NOT gate is true (1) if, and only if, its single input is true.
2. The NAND gate is sometimes referred to as an INVERTER.
3. A NOR gate can only have two inputs.
4. TTL and CMOS are two examples of logic gates.
5. The output of an OR gate is true (1) if, and only if, both inputs are true.
6. Most digital circuits now make use of diodes and transistors in integrated circuit packages.

VOCABULARY

Delete the wrong translation:

predictable (par. 2)	prevedibile predeterminato
such as (par. 3)	uguale a come ad esempio
though (par. 4)	sebbene persino
since (par. 5)	poiché nonostante che
thus (par. 6)	tuttavia perciò
hence (par. 6)	perciò a causa di
either A or B (par. 7)	A o b A e B
both inputs (par. 7)	uno dei due input tutti e due gli input
for (par. 11)	perché per, al fine di