Digital Circuits (2024) - Tutorial Five

Question 1: Given the equation $c = a \cdot b$, determine what the variable c represents.
Question 2: Given the equation $c = a \cdot b + a \cdot \bar{b}$, determine what the variable c represents.
Question 3: Consider a system with three inputs (`a`, `b`, `c`) and one output (`d`). The output produces a logical one when:

- Input `a` is logical one, or
- Inputs `b` and `c` are both logical one.

Sketch the circuit that represents the system and write an equation to represent the output in terms of the inputs.

Question 4: Consider a system with three inputs (`a`, `b`, `c`) and one output (`d`). The relationship between inputs and output is given as:

a	b	c	d
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

- Write the sum of products equation to represent the output in terms of the inputs.
- Reduce the number of terms in the equation.
- Sketch a circuit that emulates the system.

Question 5: Consider a system represented by an unknown circuit labeled `e`. Write a truth table to represent the relationship between the inputs and the output of the system.

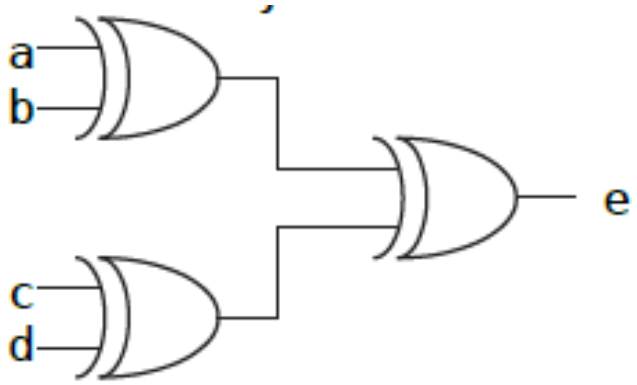

Figure 1: Question 5

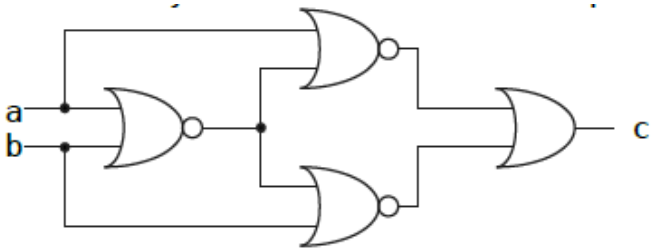

Figure 2: Question 6

Question 6: Consider a system represented by an unknown circuit labeled `c`. Write an equation and a truth table to represent the relationship between the inputs and the output of the system.

Question 7: Given the following truth table:

a	b	c
0	0	0
0	1	1
1	0	1
1	1	0

Is the following equation correct? Justify your answer:

$$a \cdot \overline{b} + \overline{a} \cdot b = a \oplus b$$