Assignment no 02: Chapter 3

Note: You can check the exercises after the book Chapter. In our assignment, we are using the 11th edition of "Digital Fundamentals" By Thomas L. Floyd"

Example 3–12 Two tanks store certain liquid chemicals that are required in a manufacturing process. Each tank has a sensor that detects when the chemical level drops to 25% of full. The sensors produce a HIGH level of 5 V when the tanks are more than one-quarter full. When the volume of chemical in a tank drops to one-quarter full, the sensor puts out a LOW level of 0 V. It is required that a single green light-emitting diode (LED) on an indicator panel show when both tanks are more than one-quarter full.

Show how a NAND gate can be used to implement this function.

Example 3–13 For the process described in Example 3–12 it has been decided to have a red LED display come on when at least one of the tanks falls to the quarter-full level rather than have the green LED display indicate when both are above one quarter.

Show how this requirement can be implemented.

Example 3–20 A certain system contains two identical circuits operating in parallel. As long as both are operating properly, the outputs of both circuits are always the same. If one of the circuits fails, the outputs will be at opposite levels at some time.

Devise a way to monitor and detect that a failure has occurred in one of the circuits.

2. A combination of inverters is shown in Figure 3–77.

If a LOW is applied to point A, **determine** the net output at points E and F.

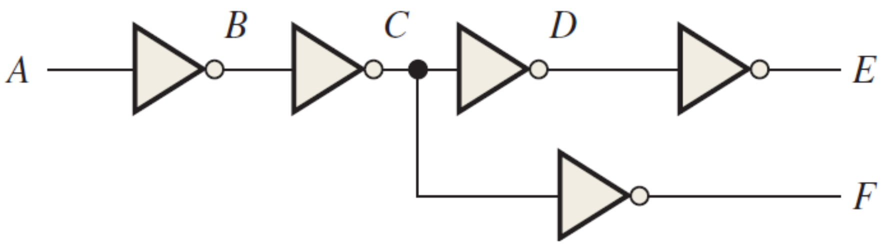

Figure 3–77

5. Determine the output, X, for a 2-input AND gate with the input waveforms shown in Figure 3–78. Show the proper relationship of output to inputs with a timing diagram.

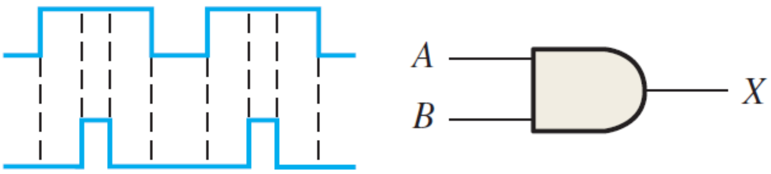

Figure 3–78

6. The waveforms in Figure 3–79 are applied to points A and B of a 2-input AND gate followed by an inverter. **Draw** the output waveform.

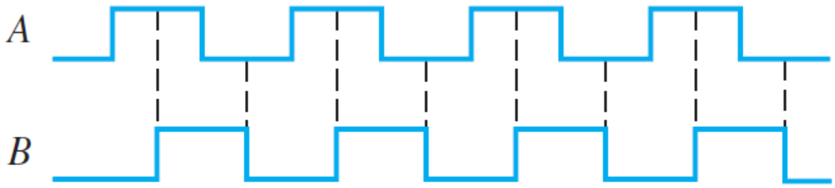

Figure 3–79

7. The input waveforms applied to a 3-input AND gate are as indicated in Figure 3–80. **Show** the output waveform in proper relation to the inputs with a timing diagram.

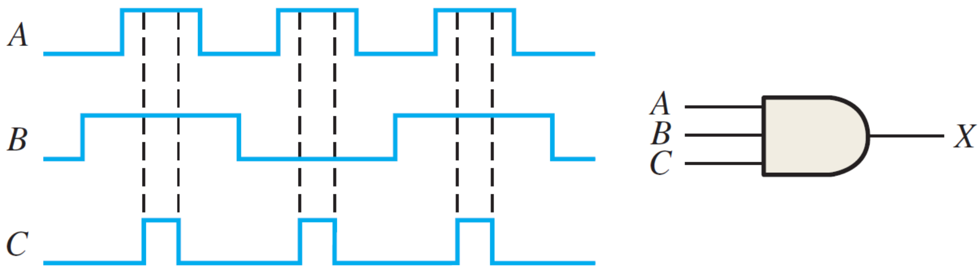

Figure 3–80

10. Write the expression for a 4-input OR gate with inputs A, B, C, D, and output X.

17. For the set of input waveforms in Figure 3–83, **determine** the output for the gate shown and draw the timing diagram.

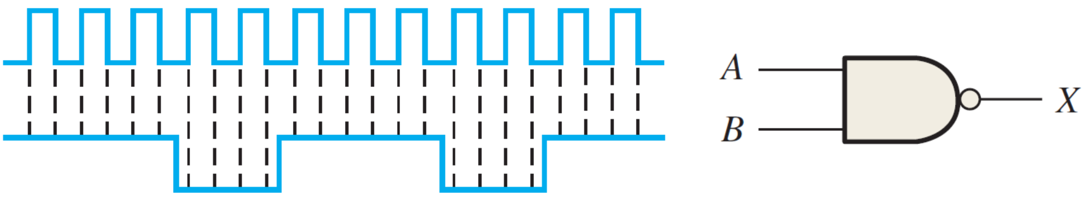

Figure 3–83

18. Determine the gate output for the input waveforms in Figure 3–84 and draw the timing diagram.

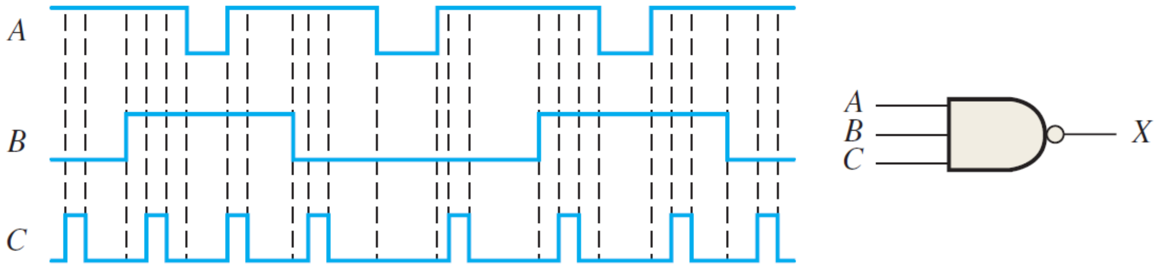

Figure 3–84

20. As you have learned, the two logic symbols shown in Figure 3–86 represent equivalent operations. The difference between the two is strictly from a functional viewpoint.

For the NAND symbol, look for two HIGHs on the inputs to give a LOW output. For the negative-OR, look for at least one LOW on the inputs to give a HIGH on the output. Using these two functional viewpoints, **show** that each gate will produce the same output for the given inputs.

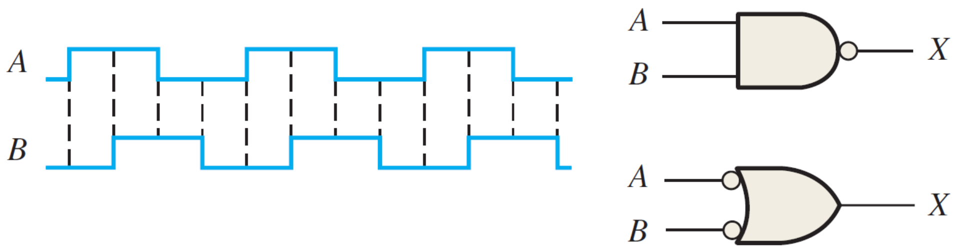

Figure 3–86

24. The NAND and the negative-OR symbols represent equivalent operations, but they are functionally different. For the NOR symbol, look for at least one HIGH on the inputs to give a LOW on the output. For the negative-AND, look for two LOWs on the inputs to give a HIGH output. Using these two functional points of view, **show** that both gates in Figure 3–88 will produce the same output for the given inputs.

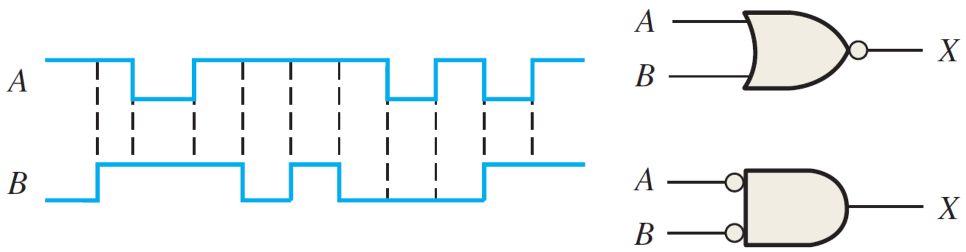

Figure 3–88

4.1. Using Boolean notation, **write** an expression that is a 0 only when all of its variables (A, B, C, and D) are 0s.

4.4. **Evaluate** the following operations:

(a) $0 + 0 + 0 + 0$ **(b)** $0 + 0 + 0 + 1$ **(c)** $1 + 1 + 1 + 1$
(d) $1 \cdot 1 + 0 \cdot 0 + 1$ **(e)** $1 \cdot 0 \cdot 1 \cdot 0$ **(f)** $1 \cdot 0 + 1 \cdot 0 + 0 \cdot 1 + 0 \cdot 1$

4.5. **Find** the values of the variables that make each product term 1 and each sum term 0.

(a) ABC **(b)** $A + B + C$ **(c)** $\overline{A}\,\overline{B}C$ **(d)** $\overline{A} + \overline{B} + C$
(e) $A + \overline{B} + \overline{C}$ **(f)** $\overline{A} + \overline{B} + \overline{C}$

4.6. **Find** the value of X for all possible values of the variables.

(a) $X = A + B + C$ **(b)** $X = (A + B)C$ **(c)** $X = (A + B)(\overline{B + C})$
(d) $X = (A + B) + (\overline{AB + BC})$ **(e)** $X = (\overline{A} + \overline{B})(A + B)$