Assignment- 3

1. Determine the output, *X*, for a 2-input AND gate with the input waveforms shown in Figure-1. Show the proper relationship of output to inputs with a timing diagram. Repeat for 2 input OR gate.

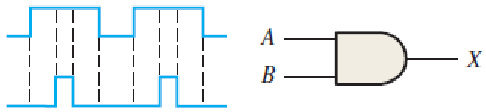

Fig-1

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

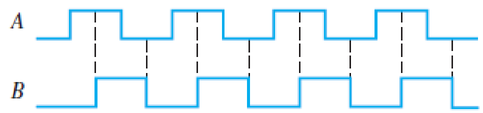

Fig-2

3. Considering (Figure -2) A and B as two inputs, draw the output for 2 input OR gate, NOR gate , NAND gate, Exclusive OR , and Exclusive NOR.
4. The input waveforms applied to a 3-input AND gate are as indicated in Figure 3. Show the output waveform in proper relation to the inputs with a timing diagram. Repeat for 3 input OR gate

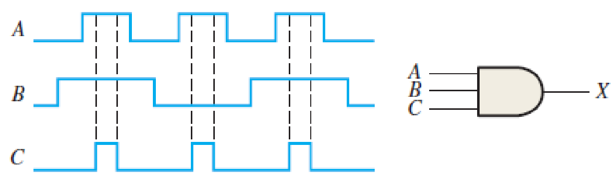

Fig-3

5. The input waveforms applied to a 4-input AND gate are as indicated in Figure 4. The output of the AND gate is fed to an inverter. Draw the net output waveform of this system. Repeat for 4 input OR gate.

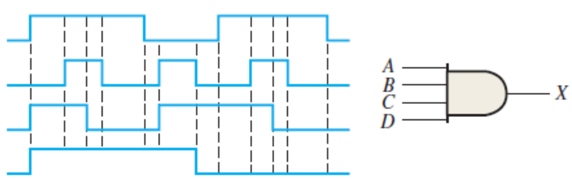

Fig-4

6. For the waveforms given in Figure 5, *A* and *B* are ANDed with output *F*, *D* and *E* are ANDed with output *G*, and *C*, *F*, and *G* are ORed. Draw the net output waveform.

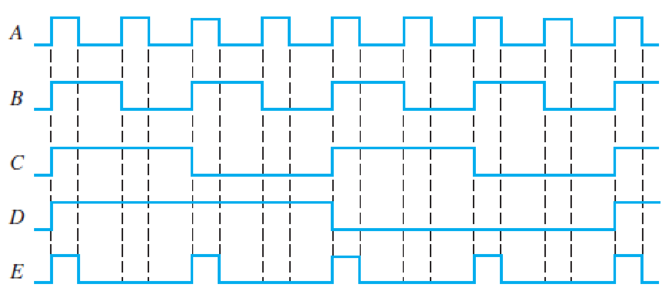

Fig-5

7. Show the truth table for a system of a 3-input OR gate followed by an inverter. For the set of input waveforms in Figure 6, determine the output for the gate shown and draw the timing diagram.

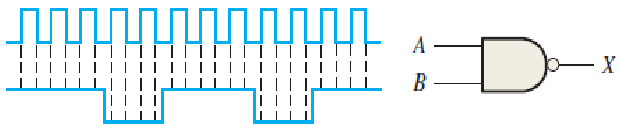

Fig-6

8. Determine the gate output for the input waveforms in Figure 7 and draw the timing diagram.

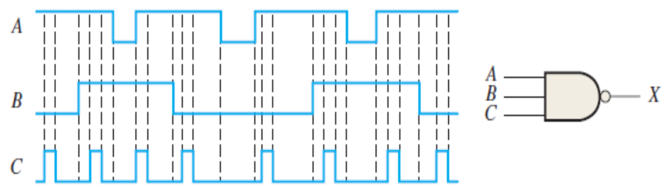

Fig-7

9. As you have learned, the two logic symbols shown in Figure 8 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.

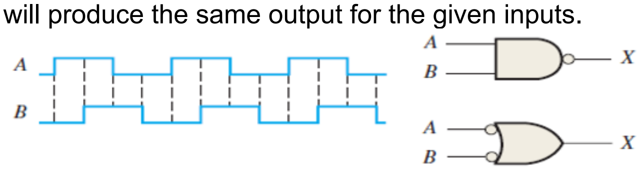

Fig-8

10. Determine the output waveform in Figure 9 and draw the timing diagram.

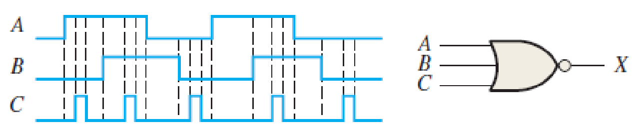

Fig-9

11. 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.

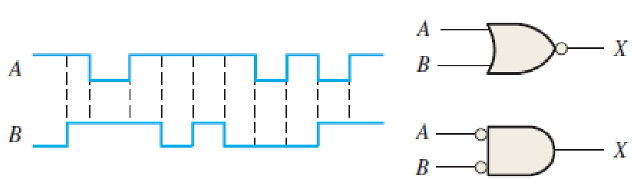

Fig-10

12. How does an exclusive-OR gate differ from an OR gate in its logical operation?
13. Simplify the Boolean expressions:
   (a) $x'y' + xy + x'y$
   (b) $(x + y)(x + y')$
   (c) $x'y + xy' + xy + x'y'$
   (d) $x' + xy + xz' + xy'z'$

14. Simplify the Boolean expressions:

(a) $A'C' + ABC + AC'$

(b) $(x'y' + z)' + z + xy + wz$

(c) $A'B(D' + C'D) + B(A + A'CD)$

(d) $(A' + C)(A' + C')(A + B + C'D)$

15.

Simplify each of the following expressions using DeMorgan's theorems.

(a)* $\overline{\overline{A}B\overline{C}}$

(b) $\overline{\overline{A} + \overline{B}C}$

(c)* $\overline{AB\overline{CD}}$

(d) $\overline{A + \overline{B}}$

(e)* $\overline{\overline{A}\,\overline{B}}$

(f) $\overline{\overline{A} + \overline{C} + \overline{D}}$

(g)* $\overline{A(\overline{B + \overline{C}})D}$

(h) $\overline{(M + \overline{N})(\overline{M} + N)}$

(i) $\overline{\overline{AB}CD}$