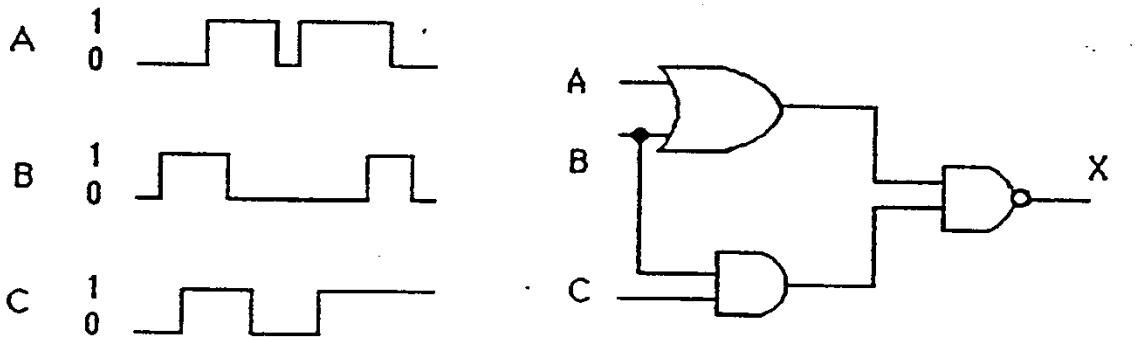
SC1005 Digital Logic Tutorial 2

Logic gates and Boolean algebra

1. From the following figure,

    a) Express X as a Boolean function of inputs A, B and C.

    b) Sketch the output waveform at point X.



2. A logic circuit's output expression is Y = [(A B' C) + D]'.

    (a) Draw the logic circuit diagram for Y.

    (b) Construct the truth table for the circuit.

3. Simplify the following expressions using Boolean algebra:

    a) X = A'B'C'D' + A'B'CD' + A'BCD' + ABCD' + AB'CD'

    b) X = [AB (C+D)'AB]'

    c) X = A(AB)' + A'B'C + ABC

4. Show using Boolean algebra that the following equation is true.

    AB + ABC′D + ABDE′ + A′BC′E + A′B′C′E = AB + A′C′E

5. Implement the function (A+B)(C+D) using only

    a) Two-input NAND gates

    b) Two-input NOR gates

Answers

1. (a) X = [(A + B) B C]’

2. (b) There are 7 1’s in the Y column of the truth table

3. a) X = A'B'D' + CD'

   b) X = A' + B' + C+D

   c) X = AB' + AC + B'C

5. a) 8 two-input NAND gates needed.

   b) 3 two-input NOR gates needed.