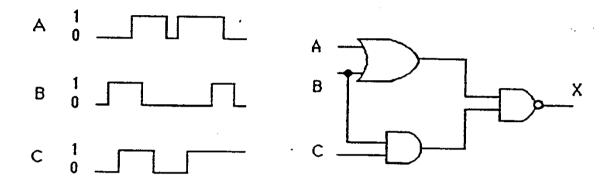
## **CE/CZ1005 Digital Logic Tutorial 2**

## 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.