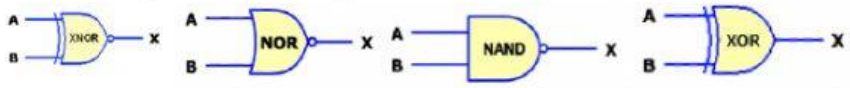
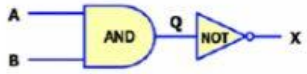
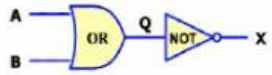
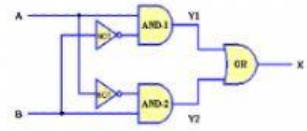
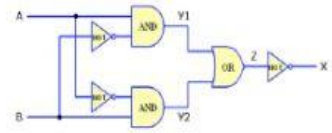
Q1) complete the table by dropping the Boolean functions and the logic circuit symbol to their correct places and filling out the Truth tables.




| | | | |
|---|---|---|---|
| $X = \overline{A + B}$ | X=A⊕B | $X = \overline{A.B}$ | $X = \overline{A \oplus B}$ |

| Circuit | Table | Relationship between inputs | Numerical Boolean Function |
|---|---|---|---|
|   ..... | A B X<br>0 0<br>0 1<br>1 0<br>1 1 | Lamp will turn OFF only if both inputs where ……. (ON, OFF) | ..... |
|   ..... | A B X<br>0 0<br>0 1<br>1 0<br>1 1 | Lamp will turn ON if and only if both A and B where …. (ON, OFF) | ..... |
|   ..... | A B X<br>0 0<br>0 1<br>1 0<br>1 1 | Lamp will turn …. when the A and B are equal. (ON, OFF) | ..... = $(\mathbf{A} \bullet \bar{\mathbf{B}}) + (\bar{\mathbf{A}} \bullet \mathbf{B})$. |
|   ..... | A B X<br>0 0<br>0 1<br>1 0<br>1 1 | Lamp will turn ……. when A and B are equal. (ON, OFF) | ..... $X = (\bar{A} + B) \cdot (A + \bar{B})$ |

Q2) Fill in the blanks with correct word from the bank below.
**[combination, Truth table, feedback, Boolean Algebra, memoryless, AND, Logic Circuit]**

Combinational Logic Circuits are ……..digital logic circuits whose output at any instant in time depends only on the combination of its inputs. The result is that combinational logic circuits have no……, and any changes to the signals being applied to their inputs will immediately have an effect at the output. In other words, in a

Combinational Logic Circuit, the output is dependent at all times on the …….. of its inputs. Thus a combinational circuit is memoryless.

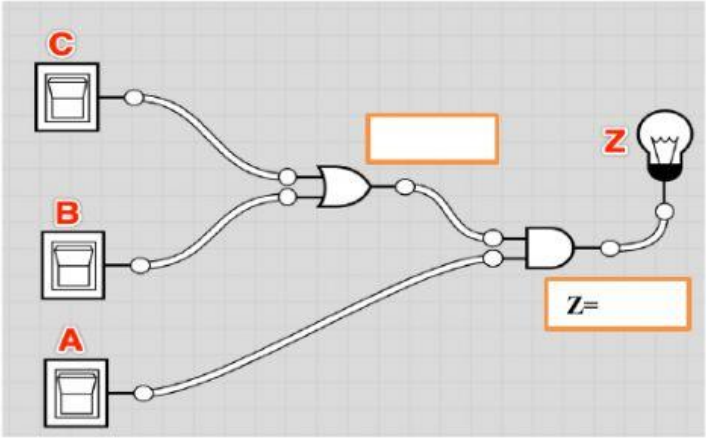
Combinational Logic Circuits are made up from basic logic …… , OR, NOT, NAND, NOR gates that are "combined" or connected together to produce more complicated switching circuits.

There are 3 ways to represent combinational logic functions:

1. ……: specifies the relationship between Boolean variables which is used to design digital circuits using Logic Gates.
2. ……: is used in logic to compute the functional values of logical expressions on each combination of values taken by their logical variables.
3. ……: This is a graphical representation of a logic circuit that shows the wiring and connections of each individual logic gate, represented by a specific graphical symbol, that implements the logic circuit.

Q3) For the circuit shown below:

i. label all intermediate signals (outputs that feed inputs) on the graph.

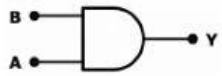
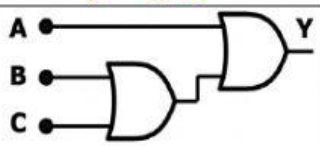
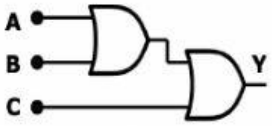
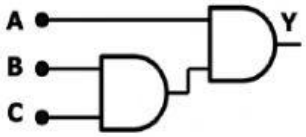
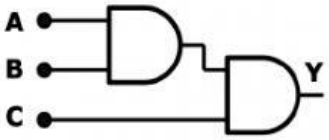



ii. Complete the truth table:

| Inputs | | | Outputs |
|---|---|---|---|
| A | B | C | Z |
| 0 | 0 | 0 | |
| 0 | 0 | 1 | |
| 0 | 1 | 0 | |
| 0 | 1 | 1 | |
| 1 | 0 | 0 | |
| 1 | 0 | 1 | |
| 1 | 1 | 0 | |
| 1 | 1 | 1 | |

Q3) Boolean Algebra rules:

i. Complete the table as shown in the example.

| Logic circuit | Circuit equivalent | Boolean Algebra rule name |
|---|---|---|
|  |  | **Cumulative rule** |
| $Y = A + B$ | $Y = B + A$ | **Boolean Functions** |
|  |  | …….. |
| $Y = A \cdot B$ | $Y =$ · | **Boolean Functions** |
|  |  | …….. |
| Y= | Y= (A+B)+C | **Boolean Functions** |
|  |  | …….. |
| Y=A(BC) | Y= | **Boolean Functions** |

ii. Use Boolean algebra distributive law to write the equivalent expressions for the following:

$A \cdot (B + C) =$ …… use ( )

$A + (B \cdot C) =$ ……. use ( )

iii. Use De Morgan's law to write the equivalent expressions for the following:

$\overline{\bar{A} \cdot \bar{B}} =$ ……

$\overline{\bar{A} + \bar{B}} =$ …….