**ANSWER TO WEEK 3 ASSIGNMENT**

1. A **Logic Gate** is an assortment of electronically controlled switches that implement Boolean logic processes. The process consists of a logical operation on one or more logical input that generates a solitary logic output.
2. Describing the following Operations
3. **OR Operations with OR Gates**: This has two inputs and one output. It is like the **ADD** operation which takes two arguments (two inputs) and produces one result (one output). The inputs to an OR operation can only be True or False and the result can only be True or False.
4. **AND Operation with AND Gates:** This has two inputs and one output. It is like the **MULTIPLICATION** operation which takes two arguments (two inputs) and Produces one result (one output). The input to an AND operation can only be True or False and the result can only be True or False.
5. **NOT Operation with NOT Gates:** This has one input and one output. It is like the **NEGATIVE** operation which takes one argument (one input) and produces one result (one output). The input to a NOT operation can only be True or False and the result can only be False or True. The will always produce a True output if its input is False and produce a False output if its input is True.
6. **NOR Operation with NOR Gates:** This is a combination of OR gate followed by an inverter (NOT gate). Its output is True if both input are False. Otherwise, the output is False.
7. **NAND Operations with NAND Gates:** This operates as an AND gate followed by a NOT fate, it acts in the manner of the logical operation AND followed by negation. Te output is False if both are True. Otherwise, the output is True.
8. Completing the Truth Tables:
9. AND operation: (\*)

|  |  |  |
| --- | --- | --- |
| **A** | **B** | **A\*B** |
| True | True | True |
| True | False | False |
| False | True | False |
| False | False | False |

1. OR operation: (+)

|  |  |  |
| --- | --- | --- |
| **A** | **B** | **A+B** |
| True | True | True |
| True | False | True |
| False | True | True |
| False | False | False |

1. NOT operation: (!)

|  |  |
| --- | --- |
| **A** | **!A** |
| True | False |
| False | True |

1. Combination AND, OR and NOT gates:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **A** | **B** | **A+B** | **A\*B** | **A+(A\*B)** | **A\*(A+B)** | **!(A+B)** | **(A+B)\*(A\*B)** |
| True | True | True | True | True | True | False | True |
| True | False | True | False | True | True | False | False |
| False | True | True | False | False | False | False | False |
| False | False | False | False | False | False | True | False |

1. Using the information given to solve the questions
2. The propositional formula for each suspect are as follows:

Brown - !J\*S

Jones- !B (implies) !S

Smith- S\*(!B+!J)

THE TRUTH TABLE FOR THE THREE TESTIMONIES

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **B** | **J** | **S** | **!B** | **!J** | **!S** | **!B+!J** | **!J\*S** | **!B(implies)!S** | **S\*(!B+!J)** |
| True | True | True | False | False | False | False | False | True | False |
| True | True | False | False | False | True | False | False | True | False |
| True | False | True | False | True | False | True | True | True | True |
| True | False | False | False | True | True | True | False | True | False |
| False | True | True | True | False | False | True | False | False | True |
| False | True | False | True | False | True | True | False | True | False |
| False | False | True | True | True | False | True | True | False | True |
| False | False | False | True | True | True | True | False | True | False |

1. Using the truth table to answer the following questions:
2. Smith’s testimony is the implication of Brown’s testimony
3. Brown and Smith
4. Brown and smith are innocent and Jones is guilty
5. Brown and Smith are guilty while Jones is innocent
6. Logical symbols and Determination of the deduction given if valid or not:
7. Let P represent My grandfather is smoking a pipe

Let Q represent He is reading the newspaper

Logical symbol for the logical argument and Deduction are:

P Q and P **^** Q

Using the truth table to determine if the deduction is valid or not

|  |  |  |  |
| --- | --- | --- | --- |
| **P** | **Q** | **P(implies)Q** | **P\*Q** |
| True | True | **True** | **True** |
| True | False | **False** | **False** |
| False | True | **True** | **False** |
| False | False | **True** | **False** |

From the truth table it is found that the deduction is not valid

1. Let E represent I want to eat ice cream

Let M represent I want to go the movie theatre

Let D represent I want to rent a DVD

Logical symbol for the logical argument and Deduction are:

(E^M) **˅**(E^D) and E^(M **˅** D)

Using the truth table to determine if the deduction is valid or not

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **E** | **M** | **D** | **E\*M** | **E\*D** | **M+D** | **(E\*M)+(E\*D)** | **E\*(M+D)** |
| True | True | True | True | True | True | **True** | **True** |
| True | True | False | True | False | True | **True** | **True** |
| True | False | True | False | True | True | **True** | **True** |
| True | False | False | False | False | False | **False** | **False** |
| False | True | True | False | False | True | **False** | **False** |
| False | True | False | False | False | True | **False** | **False** |
| False | False | True | False | False | True | **False** | **False** |
| False | False | False | False | False | False | **False** | **False** |

From the truth table the deduction is valid