**Problem 1: X = A + BC**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **BC** | **X** |
| **0** | **0** | **0** | **0** | **0** |
| **0** | **0** | **1** | **0** | **1** |
| **0** | **1** | **0** | **0** | **0** |
| **0** | **1** | **1** | **0** | **1** |
| **1** | **0** | **0** | **0** | **0** |
| **1** | **0** | **1** | **0** | **1** |
| **1** | **1** | **0** | **1** | **1** |
| **1** | **1** | **1** | **1** | **1** |

**Circuit Representation:**



**Problem 2: X = A(B+D)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **B** | **D** | **B+D** | **X** |
| **0** | **0** | **0** | **0** | **0** |
| **0** | **0** | **1** | **1** | **1** |
| **0** | **1** | **0** | **1** | **0** |
| **0** | **1** | **1** | **1** | **1** |
| **1** | **0** | **0** | **0** | **0** |
| **1** | **0** | **1** | **1** | **1** |
| **1** | **1** | **0** | **1** | **1** |
| **1** | **1** | **1** | **1** | **1** |

**Circuit Representation:**



**Problem 3: X = W(V+Y)Z**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **W** | **V** | **Y** | **Z** | **V+Y** | **W(V+Y)** | **X** |
| **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **0** | **0** | **0** | **1** | **0** | **0** | **0** |
| **0** | **0** | **1** | **0** | **1** | **0** | **0** |
| **0** | **0** | **1** | **1** | **1** | **0** | **0** |
| **0** | **1** | **0** | **0** | **1** | **0** | **0** |
| **0** | **1** | **0** | **1** | **1** | **0** | **0** |
| **0** | **1** | **1** | **0** | **1** | **0** | **0** |
| **0** | **1** | **1** | **1** | **1** | **0** | **0** |
| **1** | **0** | **0** | **0** | **0** | **0** | **0** |
| **1** | **0** | **0** | **1** | **0** | **0** | **0** |
| **1** | **0** | **1** | **0** | **1** | **1** | **0** |
| **1** | **0** | **1** | **1** | **1** | **1** | **1** |
| **1** | **1** | **0** | **0** | **1** | **1** | **0** |
| **1** | **1** | **0** | **1** | **1** | **1** | **1** |
| **1** | **1** | **1** | **0** | **1** | **1** | **0** |
| **1** | **1** | **1** | **1** | **1** | **1** | **1** |

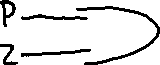
**Circuit Representation:**



**Problem 4: X = PT(P+Z)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **P** | **T** | **Z** | **P+Z** | **PT** | **X** |
| **0** | **0** | **0** | **0** | **0** | **0** |
| **0** | **0** | **1** | **1** | **0** | **0** |
| **0** | **1** | **0** | **0** | **0** | **0** |
| **0** | **1** | **1** | **1** | **0** | **0** |
| **1** | **0** | **0** | **1** | **0** | **0** |
| **1** | **0** | **1** | **1** | **0** | **0** |
| **1** | **1** | **0** | **1** | **1** | **1** |
| **1** | **1** | **1** | **1** | **1** | **1** |

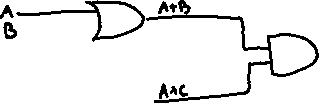
**Circuit Representation:**



**Problem 5: X = (A+B)(A+C)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **A+B** | **A+C** | **X** |
| **0** | **0** | **0** | **0** | **0** | **0** |
| **0** | **0** | **1** | **0** | **1** | **0** |
| **0** | **1** | **0** | **1** | **0** | **0** |
| **0** | **1** | **1** | **1** | **1** | **1** |
| **1** | **0** | **0** | **1** | **1** | **1** |
| **1** | **0** | **1** | **1** | **1** | **1** |
| **1** | **1** | **0** | **1** | **1** | **1** |
| **1** | **1** | **1** | **1** | **1** | **1** |

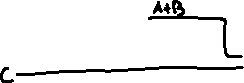
**Circuit Representation:**



**Problem 6: X = (A + B)C**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **A+B** | **X** |
| **0** | **0** | **0** | **0** | **0** |
| **0** | **0** | **1** | **0** | **0** |
| **0** | **1** | **0** | **1** | **0** |
| **0** | **1** | **1** | **1** | **1** |
| **1** | **0** | **0** | **1** | **0** |
| **1** | **0** | **1** | **1** | **1** |
| **1** | **1** | **0** | **1** | **0** |
| **1** | **1** | **1** | **1** | **1** |

**Circuit Representation:**



**Problem 7: X =  A + BC + D**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **D** | **BC** | **X** |
| **0** | **0** | **0** | **0** | **0** | **0** |
| **0** | **0** | **0** | **1** | **0** | **1** |
| **0** | **0** | **1** | **0** | **0** | **0** |
| **0** | **0** | **1** | **1** | **0** | **1** |
| **0** | **1** | **0** | **0** | **0** | **0** |
| **0** | **1** | **0** | **1** | **0** | **1** |
| **0** | **1** | **1** | **0** | **1** | **1** |
| **0** | **1** | **1** | **1** | **1** | **1** |
| **1** | **0** | **0** | **0** | **0** | **1** |
| **1** | **0** | **0** | **1** | **0** | **1** |
| **1** | **0** | **1** | **0** | **0** | **1** |
| **1** | **0** | **1** | **1** | **0** | **1** |
| **1** | **1** | **0** | **0** | **0** | **1** |
| **1** | **1** | **0** | **1** | **0** | **1** |
| **1** | **1** | **1** | **0** | **1** | **1** |
| **1** | **1** | **1** | **1** | **1** | **1** |

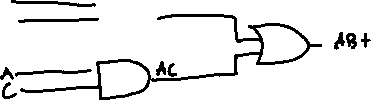
**Circuit Representation:**



**Problem 8: X = AB + AC**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **A** | **B** | **C** | **AB** | **AC** | **X** |
| **0** | **0** | **0** | **0** | **0** | **0** |
| **0** | **0** | **1** | **0** | **0** | **0** |
| **0** | **1** | **0** | **0** | **0** | **0** |
| **0** | **1** | **1** | **0** | **0** | **0** |
| **1** | **0** | **0** | **0** | **0** | **0** |
| **1** | **0** | **1** | **0** | **1** | **1** |
| **1** | **1** | **0** | **1** | **0** | **1** |
| **1** | **1** | **1** | **1** | **1** | **1** |

**Circuit Representation:**



**Problem 9: X = (A + B)(C + D)C**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D | A+B | C+D | (A+B)(C+D) | X |
| **0** | **0** | **0** | **0** | 0 | 0 | 0 | 0 |
| **0** | **0** | **0** | **1** | 0 | 1 | 0 | 0 |
| **0** | **0** | **1** | **0** | 0 | 1 | 0 | 0 |
| **0** | **0** | **1** | **1** | 0 | 1 | 0 | 0 |
| **0** | **1** | **0** | **0** | 1 | 0 | 0 | 0 |
| **0** | **1** | **0** | **1** | 1 | 1 | 1 | 0 |
| **0** | **1** | **1** | **0** | 1 | 1 | 1 | 1 |
| **0** | **1** | **1** | **1** | 1 | 1 | 1 | 1 |
| **1** | **0** | **0** | **0** | 1 | 0 | 0 | 0 |
| **1** | **0** | **0** | **1** | 1 | 1 | 1 | 0 |
| **1** | **0** | **1** | **0** | 1 | 1 | 1 | 1 |
| **1** | **0** | **1** | **1** | 1 | 1 | 1 | 1 |
| **1** | **1** | **0** | **0** | 1 | 0 | 0 | 0 |
| **1** | **1** | **0** | **1** | 1 | 1 | 1 | 0 |
| **1** | **1** | **1** | **0** | 1 | 1 | 1 | 1 |
| **1** | **1** | **1** | **1** | 1 | 1 | 1 | 1 |

**Circuit Representation:**

