1. A university student during their internship offered to automate an industrial control system using robotic sensors. They formulated the abstract nature of the problem using the following truth table with three sensor inputs T, U, and V, and a control output of X.

|  |  |  |  |
| --- | --- | --- | --- |
| T | U | V | **X** |
| 0 | 0 | 0 | **0** |
| 0 | 0 | 1 | **0** |
| 0 | 1 | 0 | **1** |
| 0 | 1 | 1 | **0** |
| 1 | 0 | 0 | **0** |
| 1 | 0 | 1 | **1** |
| 1 | 1 | 0 | **0** |
| 1 | 1 | 1 | **0** |

You are asked to design a logic circuit for the above truth table using the minimum number of NOT gates, 2-input AND gates and 2-input OR gates only. Simulate your designed circuit in the Logisim circuit simulator software and test it.

Take a screenshot of your Logisim circuit and insert it here. Your screenshot must include a text label on the circuit diagram with your name and student number.

This question is worth 1 mark.

A computer screen shot of a circuit

Description automatically generated

1. Using the Logisim circuit simulator software, draw the following circuit.

Diagram

Description automatically generated

1. Take a screenshot of your Logisim circuit and insert it here. Your screenshot must include a text label on the circuit diagram with your name and student number. (This question is worth 0.5 marks):

A diagram of a circuit

Description automatically generated

1. Using the constructed circuit, fill out the truth table below:

This question is worth 0.5 marks.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| C | D | E | F | G | H | I | X |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |