# **Homework 1: Logic diagrams Answers**

1. State the output from each of the following six logic diagrams and express the diagram in the form of Boolean algebra. For example:

A = 0

B = 1

P = **0** Boolean algebra: P = **A AND B**

A = 0

P = 1 Boolean algebra: P = A OR B

B = 1

(a) [2]

A = 1

B = 1

P = 1 Boolean algebra: P = A OR B

(b) [2]

A = 1

P = 0 Boolean algebra: P = NOT A

(c) [2]

P = 1 Boolean algebra: P = NOT (A AND B)

A = 0

(d)
 [2]

B = 1

(e) Complete the truth table for the final logic diagram in (d) above: [2]

|  |  |  |  |
| --- | --- | --- | --- |
| A | B | R = A AND B | P = NOT (A AND B) |
| 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 1 |

3. Show on the diagram below the output from each of the gates, including the output P.
 [2]

0

1

0

P = 1

1

1

4. A car has two doors. If the ignition is on, and either of the doors is not properly closed, a warning light is displayed.

 (a) Complete the truth table below. [4]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Door 1 open (D1) | Door 2 open (D2) | Ignition on (I) | Working space | Warning light on (W) |
| 0 | 0 | 0 |  | 0 |
| 0 | 0 | 1 |  | 0 |
| 0 | 1 | 0 |  | 0 |
| 0 | 1 | 1 |  | 1 |
| 1 | 0 | 0 |  | 0 |
| 1 | 0 | 1 |  | 1 |
| 1 | 1 | 0 |  | 0 |
| 1 | 1 | 1 |  | 1 |

(b) Draw a logic circuit diagram for this scenario. [4]

D1

W

I

D2

 [Total marks 20]