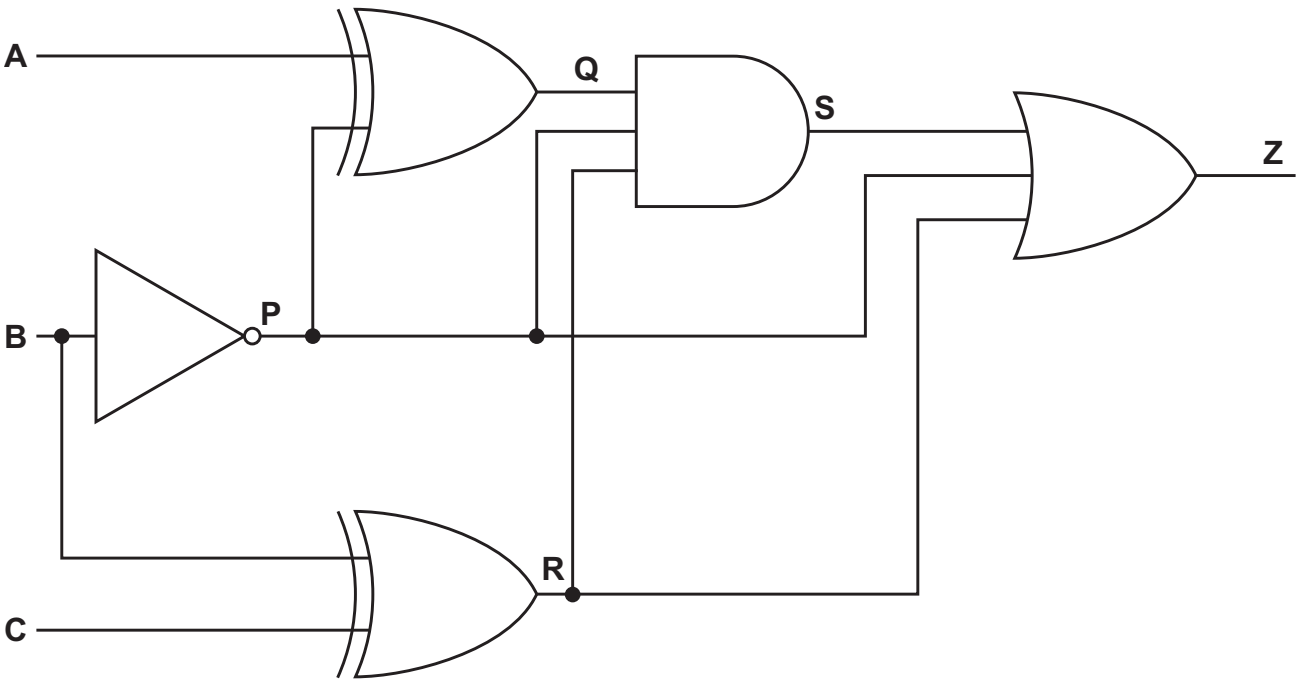


6 (a) The diagram shows a logic circuit.



Complete the truth table for the given logic circuit.  
Show your working.

|   |   |   | Working space |   |   |   |   |
|---|---|---|---------------|---|---|---|---|
| A | B | C | P             | Q | R | S | 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 |               |   |   |   |   |

[3]

(b) (i) Complete the Karnaugh map (K-map) for the Boolean expression:

$\overline{A}.\overline{B}.C + \overline{A}.B.C + A.\overline{B}.C + A.B.\overline{C}$

|   |   | BC |    |    |    |
|---|---|----|----|----|----|
|   |   | 00 | 01 | 11 | 10 |
| A | 0 |    |    |    |    |
|   | 1 |    |    |    |    |

[2]

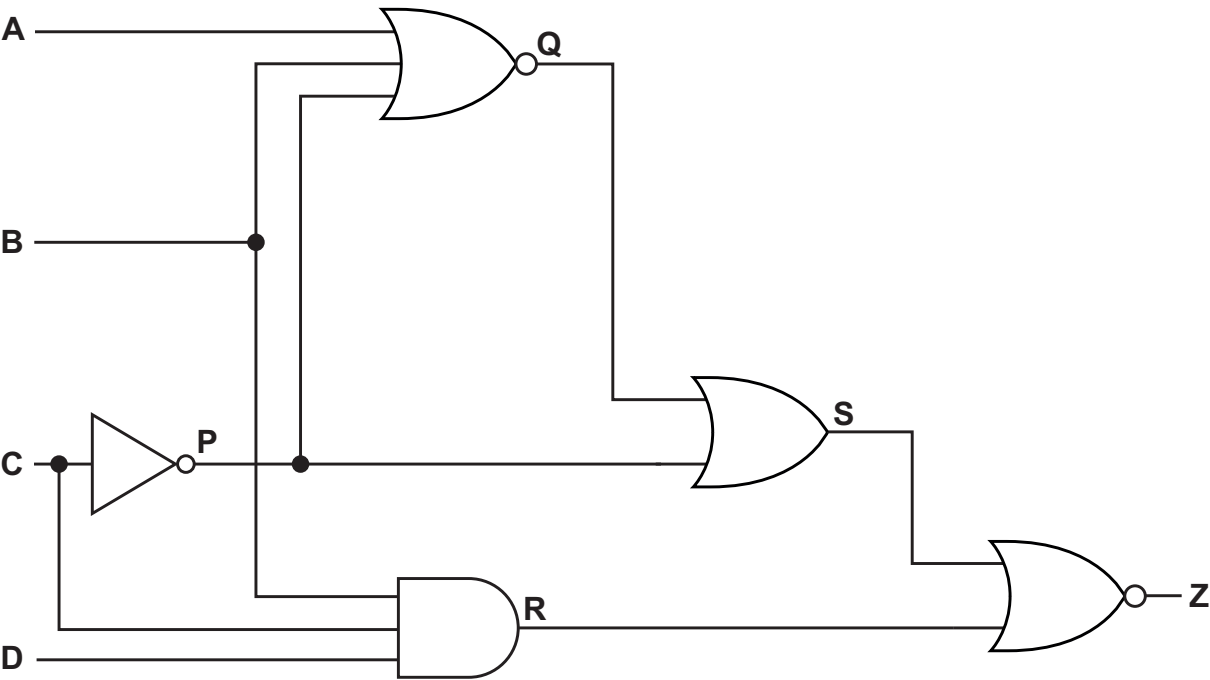
(ii) Draw loop(s) around appropriate group(s) in the K-map to produce an optimal sum-of-products. [2]

(iii) Write the Boolean expression from your answer to part **b(ii)** as a simplified sum-of-products. Do **not** carry out any further simplification.

.....

..... [2]

7 The diagram shows a logic circuit.



(a) Complete the truth table for the given logic circuit.  
Show your working.

|   |   |   |   | Working space |   |   |   |   |
|---|---|---|---|---------------|---|---|---|---|
| A | B | C | D | P             | Q | R | S | Z |
| 0 | 0 | 0 | 0 |               |   |   |   |   |
| 0 | 0 | 0 | 1 |               |   |   |   |   |
| 0 | 0 | 1 | 0 |               |   |   |   |   |
| 0 | 0 | 1 | 1 |               |   |   |   |   |
| 0 | 1 | 0 | 0 |               |   |   |   |   |
| 0 | 1 | 0 | 1 |               |   |   |   |   |
| 0 | 1 | 1 | 0 |               |   |   |   |   |
| 0 | 1 | 1 | 1 |               |   |   |   |   |
| 1 | 0 | 0 | 0 |               |   |   |   |   |
| 1 | 0 | 0 | 1 |               |   |   |   |   |
| 1 | 0 | 1 | 0 |               |   |   |   |   |
| 1 | 0 | 1 | 1 |               |   |   |   |   |
| 1 | 1 | 0 | 0 |               |   |   |   |   |
| 1 | 1 | 0 | 1 |               |   |   |   |   |
| 1 | 1 | 1 | 0 |               |   |   |   |   |
| 1 | 1 | 1 | 1 | 3             |   |   |   |   |

(b) Write the Boolean logic expression that corresponds to the given logic circuit as the sum-of-products.

Z = .....  
..... [1]

(c) Use Boolean algebra including De Morgan’s laws to simplify the following expression.  
Show all working.

$$\overline{(A + B)} \cdot (\overline{A \cdot B} + \overline{B \cdot C})$$

Working .....  
.....  
.....  
.....  
.....  
.....

Simplified expression .....  
..... [4]

6 The truth table for a logic circuit is shown.

| INPUT |   |   |   | OUTPUT |
|-------|---|---|---|--------|
| A     | B | C | D | X      |
| 0     | 0 | 0 | 0 | 0      |
| 0     | 0 | 0 | 1 | 1      |
| 0     | 0 | 1 | 0 | 1      |
| 0     | 0 | 1 | 1 | 0      |
| 0     | 1 | 0 | 0 | 0      |
| 0     | 1 | 0 | 1 | 1      |
| 0     | 1 | 1 | 0 | 1      |
| 0     | 1 | 1 | 1 | 0      |
| 1     | 0 | 0 | 0 | 0      |
| 1     | 0 | 0 | 1 | 1      |
| 1     | 0 | 1 | 0 | 1      |
| 1     | 0 | 1 | 1 | 0      |
| 1     | 1 | 0 | 0 | 0      |
| 1     | 1 | 0 | 1 | 1      |
| 1     | 1 | 1 | 0 | 1      |
| 1     | 1 | 1 | 1 | 0      |

(a) Write the Boolean logic expression that corresponds to the given truth table as the sum-of-products.

X = .....  
..... [3]

(b) Complete the Karnaugh map (K-map) for the given truth table.

|    |    | AB |    |    |    |
|----|----|----|----|----|----|
|    |    | 00 | 01 | 11 | 10 |
| CD | 00 |    |    |    |    |
|    | 01 |    |    |    |    |
|    | 11 |    |    |    |    |
|    | 10 |    |    |    |    |

[2]

(c) Draw loop(s) around appropriate group(s) in the K-map to produce an optimal sum-of-products. [2]

(d) Write the Boolean logic expression from your answer to part (c) as the simplified sum-of-products.

X = .....  
..... [2]

8 Complex Instruction Set Computer (CISC) is a type of processor.

Identify **four** features of a CISC processor.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- .....
- 4 .....
- .....

[4]

2 Reduced Instruction Set Computers (RISC) is a type of processor.

Identify **four** features of a RISC processor.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- .....
- 4 .....
- .....

[4]