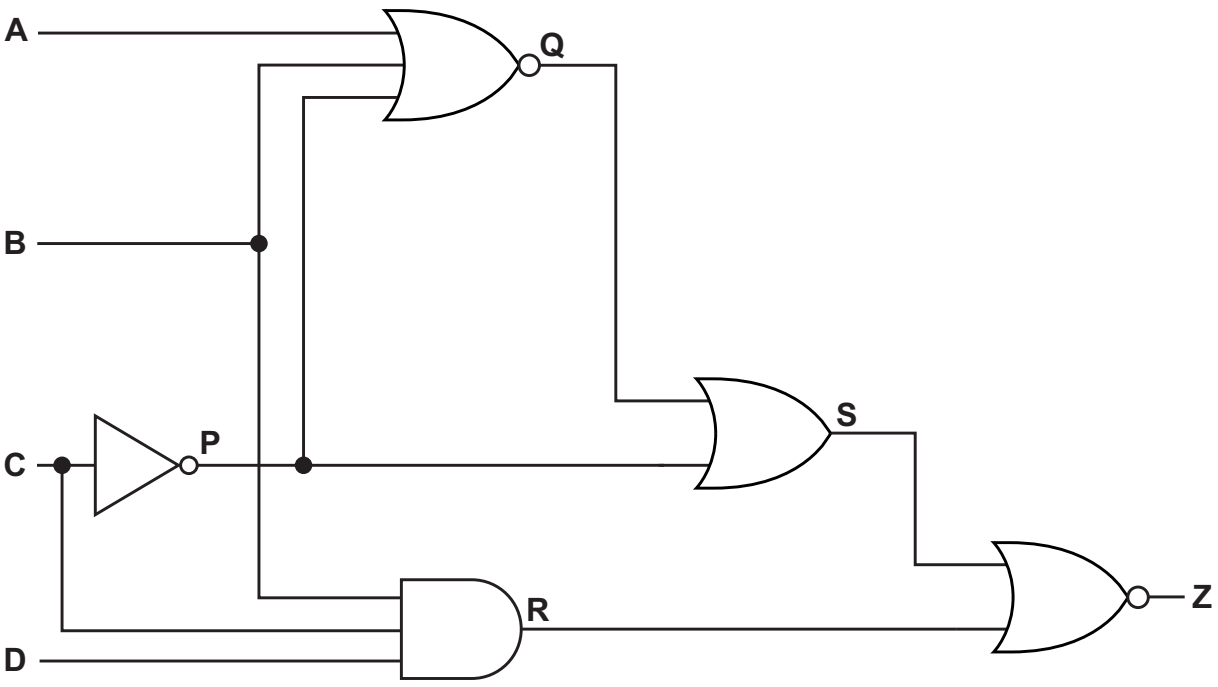
7 The diagram shows a logic circuit.



(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.

$$(\overline{\mathbf{A} + \mathbf{B}}) \,.\, (\overline{\mathbf{A} \,.\, \mathbf{B}} + \overline{\mathbf{B} \,.\, \mathbf{C}})$$

Working .....

.....

.....

.....

.....

.....

Simplified expression .....

.....

[4]