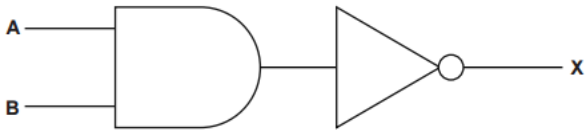
3.3.2 Boolean Algebra

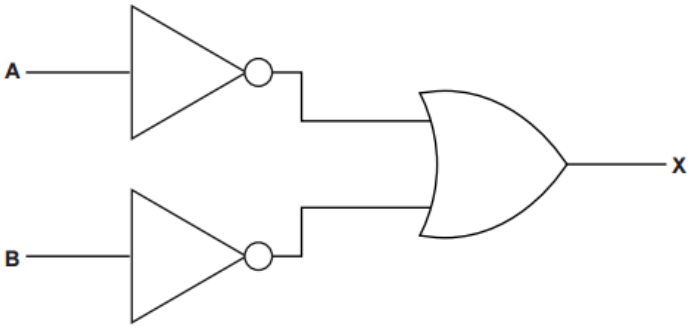
Computer Science (9608)

May/June 2015.P31/P32

4 (a) (i) Complete the truth table for this logic circuit:



(ii) Complete the truth table for this logic circuit:

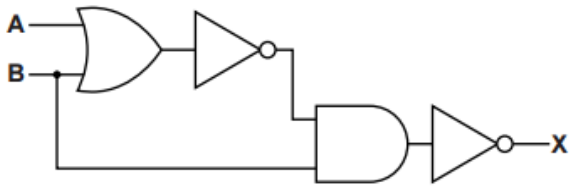


(b) A student decides to write an equation for X to represent the full behaviour of each logic circuit.

(i) Write the Boolean expression that will complete the required equation for X for each circuit:
Circuit 1: X = ...
Circuit 2: X = ... **[2]**

(ii) Write the De Morgan's Law which is shown by your answers to part (a) and part (b)(i). **[1]**

(c) Write the Boolean algebraic expression corresponding to the following logic circuit:



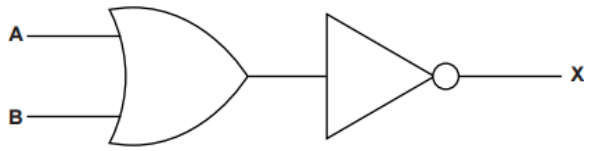
[3]

(d) Using De Morgan's laws and Boolean algebra, simplify your answer to part (c). Show all your working. **[3]**

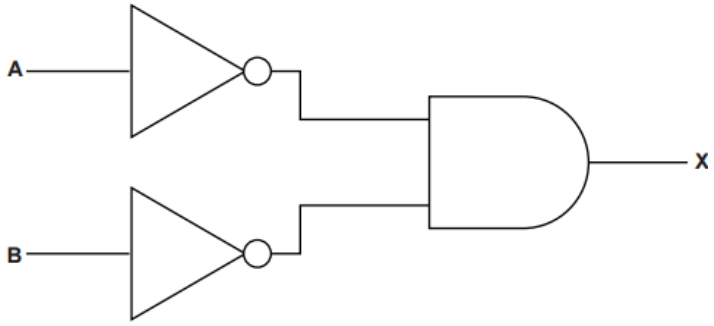
3.3.2 Boolean Algebra

May/June 2015.P33

5 (a) (i) Complete the truth table for this logic circuit:



(ii) Complete the truth table for this logic circuit:



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Circuit 1: X = ...
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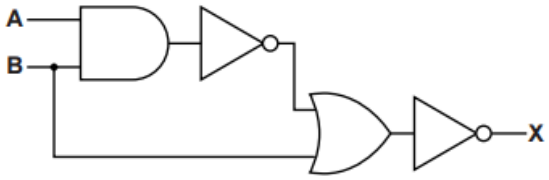


[3]

(d) Using De Morgan's laws and Boolean algebra, simplify your answer to part (c). Show all your working **[3]**

3.3.2 Boolean Algebra

Oct/Nov 2015.P31/P33

5 (a) (i) Complete the Boolean function that corresponds to the following truth table.

INPUT			OUTPUT
A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

X = A . B . C + ... **[3]**

The part to the right of the equals sign is known as the sum-of-products.
(ii) For the truth table above complete the Karnaugh Map (K-map).

		AB			
		00	01	11	10
C	0				
	1				

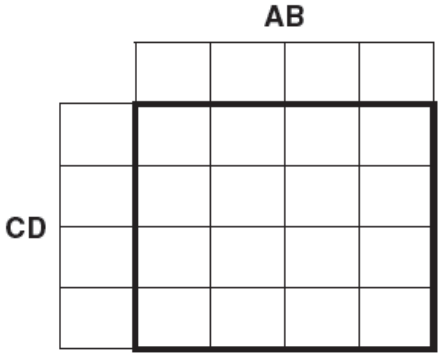
The K-map can be used to simplify the function in **part(a)(i)**.
(iii) Draw loop(s) around appropriate groups of 1's to produce an optimal sum-of-products.
(iv) Using your answer to **part (a)(iii)**, write the simplified sum-of-products Boolean function. **[2]**

(b) The truth table for a logic circuit with four inputs is given below:

3.3.2 Boolean Algebra

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

(i) Complete the K-map corresponding to the truth table above.



(ii) Draw loop(s) around appropriate groups of 1's to produce an optimal sum-of-products. **[2]**

(iii) Using your answer to **part (b)(ii)**, write the simplified sum-of-products Boolean function. **[2]**

3.3.2 Boolean Algebra

Oct/Nov 2015.P32

5 (a) (i) Complete the Boolean function that corresponds to the following truth table.

INPUT			OUTPUT
P	Q	R	Z
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

Z = P . Q . R + ... **[3]**

The part to the right of the equals sign is known as the sum-of-products.

(ii) For the truth table above complete the Karnaugh Map (K-map).

		PQ			
		00	01	11	10
R	0				
	1				

The K-map can be used to simplify the function in **part(a)(i)**.

(iii) Draw loop(s) around appropriate groups of 1's to produce an optimal sum-of-products. **[2]**

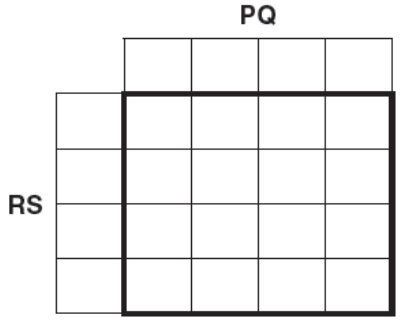
(iv) Using your answer to **part (a)(iii)**, write the simplified sum-of-products Boolean function. **[1]**

3.3.2 Boolean Algebra

(b) The truth table for a logic circuit with four inputs is given below:

INPUT				OUTPUT
P	Q	R	S	Z
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

(i) Complete the K-map corresponding to the truth table above.



(ii) Draw loop(s) around appropriate groups of 1's to produce an optimal sum-of-products. **[2]**

(iii) Using your answer to **part (b)(ii)**, write the simplified sum-of-products Boolean function. **[2]**