

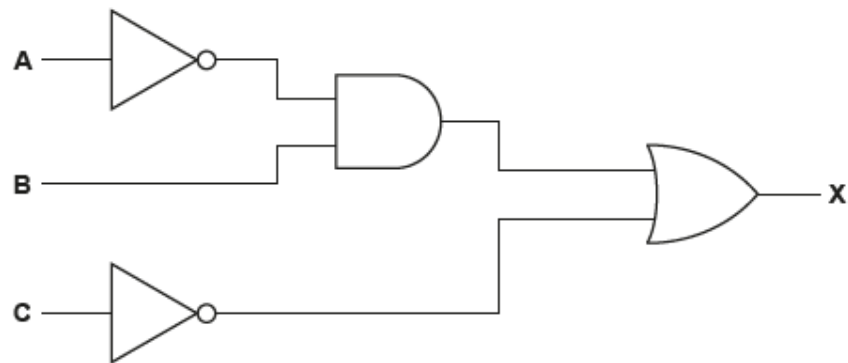
# Chapter 10

2023 Past paper

Dr. Saw Myat Sandar

0478\_w23\_qp21

7 Consider this logic circuit.



(a) Write a logic expression for this logic circuit. Do **not** attempt to simplify this logic expression.

X = .....

..... [4]

(b) Complete the truth table from the given logic circuit.

A	B	C	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

Input			Logic 1	Logic 2	Logic 3	Output
A	B	C	NOT A	NOT A AND B	NOT C	(NOT A AND B) OR NOT C
0	0	0	1	0	1	1
0	0	1	1	0	0	0
0	1	0	1	1	1	1
0	1	1	1	1	0	1
1	0	0	0	0	1	1
1	0	1	0	0	0	0
1	1	0	0	0	1	1
1	1	1	0	0	0	0

Question	Answer	Marks
7(a)	One mark for each point <ul style="list-style-type: none"> <li>• NOT A</li> <li>• AND B</li> <li>• OR NOT C</li> <li>• expression correct (NOT A AND B) OR NOT C</li> </ul>	4

Question	Answer	Marks																																				
7(b)	<table><tr><th>A</th><th>B</th><th>C</th><th>X</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table> <p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p>	A	B	C	X	0	0	0	1	0	0	1	0	0	1	0	1	0	1	1	1	1	0	0	1	1	0	1	0	1	1	0	1	1	1	1	0	4
A	B	C	X																																			
0	0	0	1																																			
0	0	1	0																																			
0	1	0	1																																			
0	1	1	1																																			
1	0	0	1																																			
1	0	1	0																																			
1	1	0	1																																			
1	1	1	0																																			

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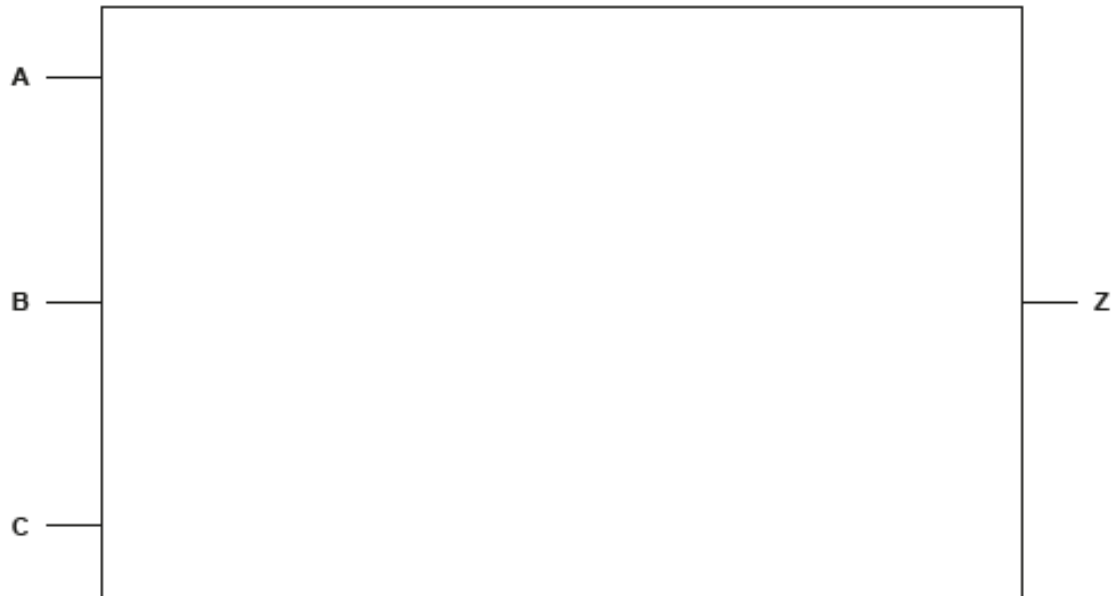
9 Consider the logic expression:

$$Z = (A \text{ NAND } B) \text{ OR NOT } (B \text{ XOR } C)$$

(a) Draw a logic circuit for this logic expression.

Each logic gate must have a maximum of **two** inputs.

Do **not** simplify this logic expression.



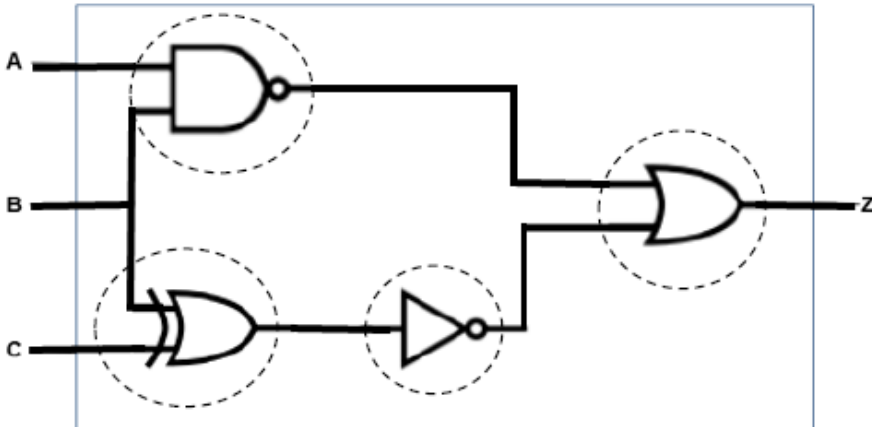
[4]

(b) Complete the truth table from the given logic expression.

A	B	C	Working space	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		

[4]

Input			Logic 1	Logic 2	Logic 3	Output
A	B	C	A NAND B	B XOR C	NOT (B XOR C)	(A NAND B) OR NOT (B XOR C)
0	0	0	1	0	1	1
0	0	1	1	1	0	1
0	1	0	1	1	0	1
0	1	1	1	0	1	1
1	0	0	1	0	1	1
1	0	1	1	1	0	1
1	1	0	0	1	0	0
1	1	1	0	0	1	1

Question	Answer	Marks																																				
9(a)	<p><b>One</b> mark for each correct gate, with the correct input(s) as shown.</p> 	4																																				
9(b)	<p><b>Four</b> marks for eight correct outputs. <b>Three</b> marks for six or seven correct outputs. <b>Two</b> marks for four or five correct outputs. <b>One</b> mark for two or three correct outputs</p> <table><tr><th>A</th><th>B</th><th>C</th><th>Z</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	A	B	C	Z	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	0	1	1	1	1	4
A	B	C	Z																																			
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	0																																			
1	1	1	1																																			

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- 6** There are **three** descriptions of logic gates. Each logic gate has two inputs **A** and **B** with one output **X**.  
Identify each logic gate.  
Complete a truth table for each logic gate.

- (a)** The only time the output is 1 is when both inputs are 1.

Logic gate .....

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

- (b)** The output is 1 when both inputs are different.

Logic gate .....

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

- (c)** The only time the output is 1 is when both inputs are 0.

Logic gate .....

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

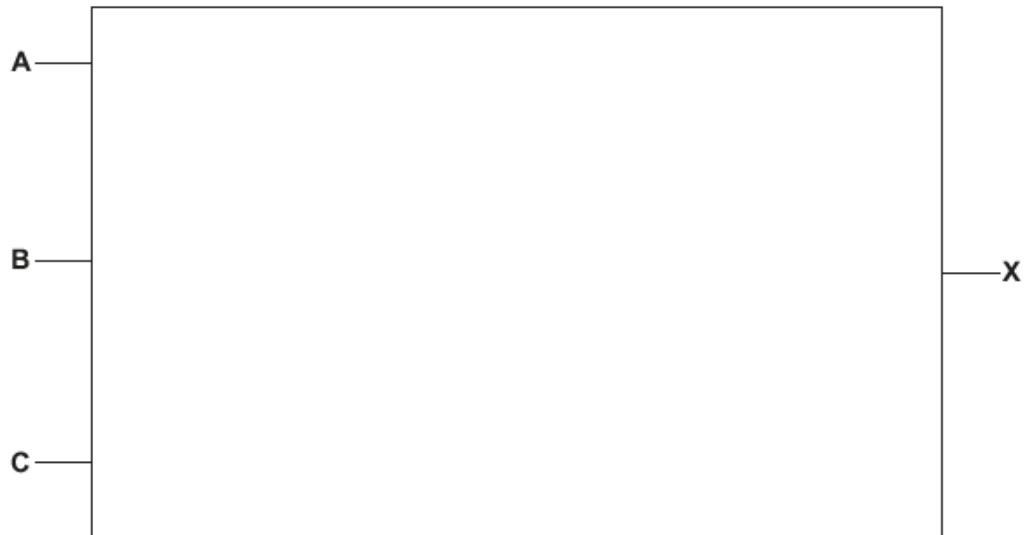


9

(d) Consider this logic expression:

$$X = (\text{NOT } A \text{ OR NOT } B) \text{ OR NOT } C$$

Draw a logic circuit for this logic expression. Each logic gate must have a maximum of **two** inputs. Do **not** attempt to simplify this logic expression.



[5]

Question	Answer	Marks															
6(a)	<p><b>One mark for correct gate and one mark for correct truth table</b></p> <p><b>AND</b></p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>X</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>0</td></tr> <tr> <td>0</td><td>1</td><td>0</td></tr> <tr> <td>1</td><td>0</td><td>0</td></tr> <tr> <td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	A	B	X	0	0	0	0	1	0	1	0	0	1	1	1	2
A	B	X															
0	0	0															
0	1	0															
1	0	0															
1	1	1															
6(b)	<p><b>One mark for correct gate and one mark for correct truth table</b></p> <p><b>XOR // EOR</b></p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>X</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>0</td></tr> <tr> <td>0</td><td>1</td><td>1</td></tr> <tr> <td>1</td><td>0</td><td>1</td></tr> <tr> <td>1</td><td>1</td><td>0</td></tr> </tbody> </table>	A	B	X	0	0	0	0	1	1	1	0	1	1	1	0	2
A	B	X															
0	0	0															
0	1	1															
1	0	1															
1	1	0															

Question	Answer	Marks															
6(c)	<p><b>One mark for correct gate and one mark for correct truth table</b></p> <p><b>NOR</b></p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>X</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td>1</td></tr> <tr> <td>0</td><td>1</td><td>0</td></tr> <tr> <td>1</td><td>0</td><td>0</td></tr> <tr> <td>1</td><td>1</td><td>0</td></tr> </tbody> </table>	A	B	X	0	0	1	0	1	0	1	0	0	1	1	0	2
A	B	X															
0	0	1															
0	1	0															
1	0	0															
1	1	0															
6(d)	<p><b>One mark for each correct gate, with the correct input(s) as shown.</b></p>	5															



0478\_s23\_qp\_21

- 9 Consider this logic expression.

$$Z = (\text{NOT } A \text{ OR } B) \text{ AND } (B \text{ XOR } C)$$

- (a) Draw a logic circuit for this logic expression.

Each logic gate must have a maximum of **two** inputs.

Do **not** simplify this logic expression.



[4]

- (b) Complete the truth table from the given logic expression.

A	B	C	Working space	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		

[4]

Input			Logic 1	Logic 2	Logic 3	Output
A	B	C	NOT A	NOT A OR B	B XOR C	(NOT A OR B) AND (B XOR C)
0	0	0	1	1	0	0
0	0	1	1	1	1	1
0	1	0	1	1	1	1
0	1	1	1	1	0	0
1	0	0	0	0	0	0
1	0	1	0	0	1	0
1	1	0	0	1	1	1
1	1	1	0	1	0	0

Question	Answer	Marks
9(a)	<p>One mark for each correct gate, with the correct input(s) as shown.</p>	4

Question	Answer	Marks																																				
9(b)	<p>Four marks for eight correct outputs. Three marks for six or seven correct outputs. Two marks for four or five correct outputs. One mark for two or three correct outputs</p> <table><tr><th>A</th><th>B</th><th>C</th><th>Z</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table>	A	B	C	Z	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	0	1	0	0	0	1	0	1	0	1	1	0	1	1	1	1	0	4
A	B	C	Z																																			
0	0	0	0																																			
0	0	1	1																																			
0	1	0	1																																			
0	1	1	0																																			
1	0	0	0																																			
1	0	1	0																																			
1	1	0	1																																			
1	1	1	0																																			

0478\_s23\_qp\_22

8 Consider this logic expression.

$$X = (A \text{ OR } B) \text{ AND } (\text{NOT } B \text{ AND } C)$$

Complete the truth table for this logic expression.

A	B	C	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

Input			Logic 1	Logic 2	Logic 3	Output
A	B	C	A OR B	NOT B	NOT B AND C	(A OR B) AND (NOT B AND C)
0	0	0	0	1	0	0
0	0	1	0	1	1	0
0	1	0	1	0	0	0
0	1	1	1	0	0	0
1	0	0	1	1	0	0
1	0	1	1	1	1	1
1	1	0	1	0	0	0
1	1	1	1	0	0	0

Question	Answer	Marks																																				
8	<p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p> <table><tr><th>A</th><th>B</th><th>C</th><th>X</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table>	A	B	C	X	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	0	4
A	B	C	X																																			
0	0	0	0																																			
0	0	1	0																																			
0	1	0	0																																			
0	1	1	0																																			
1	0	0	0																																			
1	0	1	1																																			
1	1	0	0																																			
1	1	1	0																																			

0478\_s23\_qp\_23

8 Consider the logic expression:

**Z** is 1 if (**A** = 1 AND **C** = NOT 1) AND (**B** = 1 NOR **C** = 1)

(a) Draw a logic circuit for this logic expression.

Each logic gate must have a maximum of **two** inputs.

Do **not** simplify this logic expression.



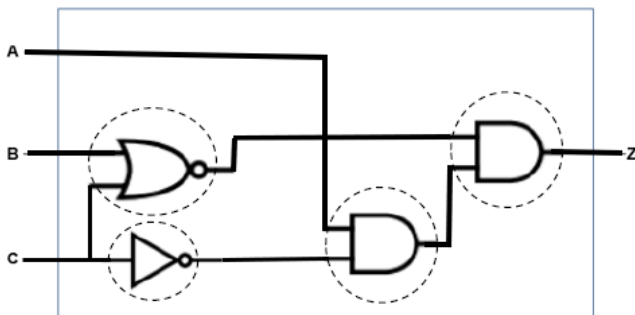
[4]

(b) Complete the truth table from the given logic expression.

A	B	C	Working space	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		

[4]

Input			Logic 1	Logic 2	Logic 3	Output
A	B	C	NOT C	A AND NOT C	B NOR C	(A AND NOT C) AND (B NOR C)
0	0	0	1	0	1	0
0	0	1	0	0	0	0
0	1	0	1	0	0	0
0	1	1	0	0	0	0
1	0	0	1	1	1	1
1	0	1	0	0	0	0
1	1	0	1	1	0	0
1	1	1	0	0	0	0

Question	Answer	Marks
8(a)	<p>One mark for each correct gate, with the correct input(s) as shown.</p> 	4

Question	Answer	Marks																																				
8(b)	<p>Four marks for eight correct outputs. Three marks for six or seven correct outputs. Two marks for four or five correct outputs. One mark for two or three correct outputs</p> <table><tr><th>A</th><th>B</th><th>C</th><th>Z</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table>	A	B	C	Z	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0	1	1	0	1	0	1	1	0	0	1	1	1	0	4
A	B	C	Z																																			
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1	1	1	0																																			

0478\_m23\_qp\_22

7 Consider this logic expression.

$$X = (A \text{ OR NOT } B) \text{ AND } (B \text{ AND NOT } C)$$

- (a) Draw a logic circuit for this logic expression. Each logic gate must have a maximum of **two** inputs. Do **not** simplify this logic expression.



[5]

- (b) Complete the truth table from the given logic expression.

A	B	C	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

Input			Logic 1	Logic 2	Logic 3		Output
A	B	C	NOT B	A OR NOT B	NOT C	B AND NOT C	(A OR NOT B) AND (B AND NOT C)
0	0	0	1	1	1	0	0
0	0	1	1	1	0	0	0
0	1	0	0	0	1	1	0
0	1	1	0	0	0	0	0
1	0	0	1	1	1	0	0
1	0	1	1	1	0	0	0
1	1	0	0	1	1	1	1
1	1	1	0	1	0	0	0

Question	Answer	Marks
7(a)	<p>One mark for each correct gate, with the correct inputs as shown.</p>	5

Question	Answer	Marks																																				
7(b)	<table><tr><th>A</th><th>B</th><th>C</th><th>X</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table> <p>4 marks for 8 correct outputs 3 marks for 6/7 correct outputs 2 marks for 4/5 correct outputs 1 mark for 2/3 correct outputs</p>	A	B	C	X	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	1	1	1	1	0	4
A	B	C	X																																			
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	1																																			
1	1	1	0																																			