MODULE Q BOOLEAN LOGIC · Q5

Completing a truth table for a logic circuit

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 10.2, 10.3(b)

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. Use 1 and 0 for the inputs and outputs. Shaded cells have been filled in for you. The working space columns are not marked. The marks for each part are shown in brackets [ ]. The total for this worksheet is **21 marks**.

1

Total: 2 marks

(a) A logic circuit has three inputs and one output. State the number of rows of input values needed in its truth table. **[1]**

(b) Complete columns B and C of this truth table so that every possible combination of the inputs A, B and C appears exactly once. **[1]**

A	B	C
0		
0		
0		
0		
1		
1		
1		
1		

2 Total: 4 marks

Consider the logic circuit in Fig. 1.

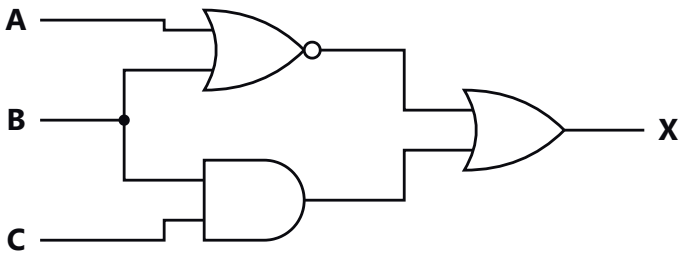


Fig. 1

Complete the truth table for the logic circuit in Fig. 1. **[4]**

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		

3 Total: 4 marks

Consider this logic expression:

```
Z = (A XOR C) NOR (B AND C)
```

Complete the truth table for the logic expression. **[4]**

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 **Total: 4 marks**

A water tank at a factory is filled by two pumps. A monitoring system gives a warning (W = 1) when:
• the water level is low **and** neither pump is running
or
• both pumps are running.

Input	Description	Binary value 1	Binary value 0
P	Pump 1	Running	Not running
Q	Pump 2	Running	Not running
L	Water level	Low	Not low

Complete the truth table for this problem statement. **[4]**

P	Q	L	Working space	W
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

5 Total: 3 marks

A technician completed the truth table for the logic circuit in Fig. 2. **Three** of the values in column X are incorrect.

Circle the **three** incorrect values in column X. **[3]**

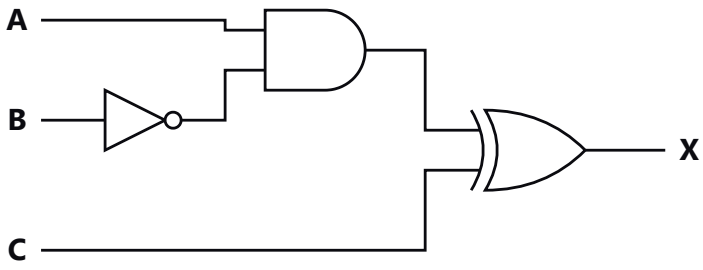


Fig. 2

A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

6 Total: 4 marks

Consider the logic circuit in Fig. 3. It has two inputs, A and B.

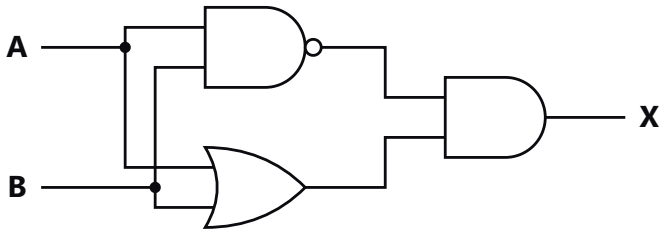


Fig. 3

(a) Complete the truth table for the logic circuit in Fig. 3. **[3]**

A	B	A NAND B	A OR B	X
0	0			
0	1			
1	0			
1	1			

(b) Identify the **single** logic gate that gives the same output as the whole circuit in Fig. 3. **[1]**

Total for this worksheet: 21 marks