MODULE Q BOOLEAN LOGIC · Q4

Reading logic circuits with more than one gate

Original practice questions · 21 marks · ~25 minutes · Cambridge 0478 syllabus 10.1, 10.2, 10.3(b)(iii) and 10.3(c)(ii)

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. In every circuit, 1 means on / True and 0 means off / False. Each logic gate has a maximum of two inputs, except NOT, which has one. The total for this worksheet is **21 marks**.

1

Total: 4 marks

Fig. 1 shows a logic circuit. The output of gate 1 is labelled P.

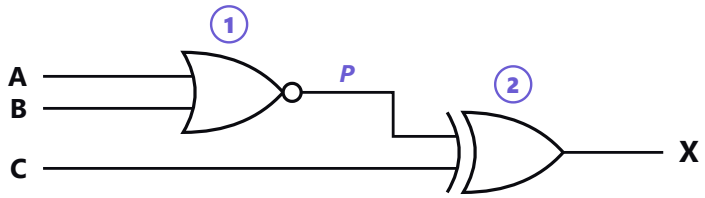


Fig. 1

(a) Identify the logic gate labelled **1** and the logic gate labelled **2** in Fig. 1. **[2]**

Gate 1	
Gate 2	

(b) The inputs are A = 0, B = 0 and C = 1. State the value of P and the value of X. **[2]**

P = ... **X =** .....

2 **Total: 4 marks**

Fig. 2 shows a logic circuit.

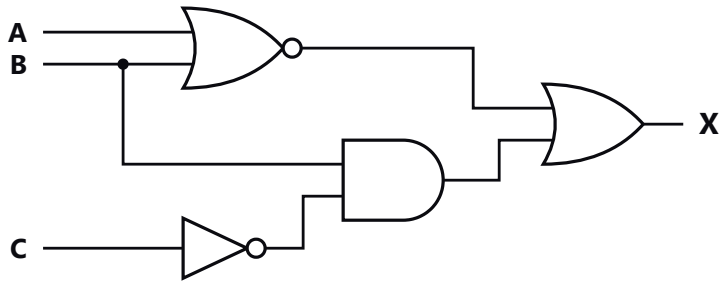


Fig. 2

(a) Complete the truth table for the logic circuit in Fig. 2. **[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: 3 marks**

Fig. 3 shows a logic circuit.

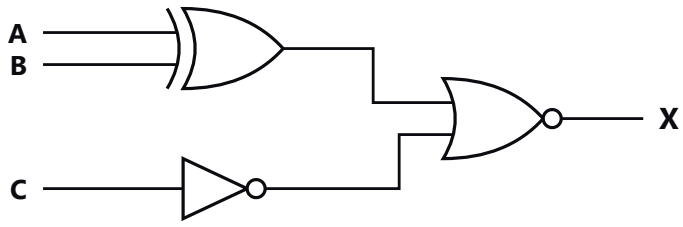


Fig. 3

(a) Write the logic expression for the logic circuit in Fig. 3. Do **not** attempt to simplify the logic expression. **[3]**

X = ...

4

Total: 3 marks

Fig. 4 shows two different logic circuits. Each circuit uses one OR gate and one NOT gate.



Fig. 4

(a) The inputs to both circuits are A = 1 and B = 1. State the output P of circuit 1 and the output Q of circuit 2. **[2]**

P = ... **Q =** .....

(b) Identify the **single** logic gate that gives the same output as circuit 1 for every combination of inputs. **[1]**

.....

5

Total: 4 marks

A fan in a print workshop is controlled by the logic circuit in Fig. 5.

Input / output	Meaning
D (dust sensor)	1 = dust level high, 0 = dust level normal
T (temperature sensor)	1 = too hot, 0 = not too hot
M (maintenance switch)	1 = switched on, 0 = switched off
F (output)	1 = fan on, 0 = fan off

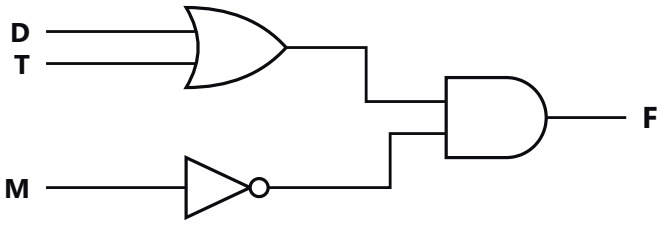


Fig. 5

(a) The dust level is high, the workshop is not too hot and the maintenance switch is on. State the value of F. **[1]**

.....

(b) Describe the conditions that make the fan switch on. **[3]**

.....

.....

.....

6 **Total: 3 marks**

Fig. 6 shows another logic circuit.

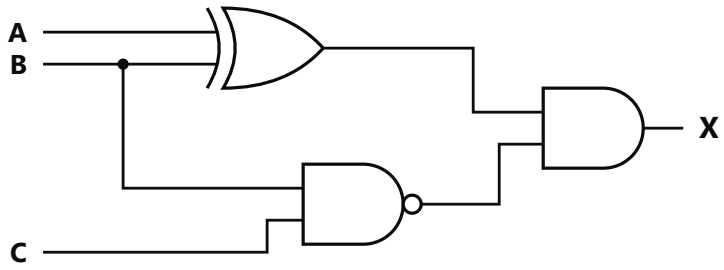


Fig. 6

An engineer says: "Whenever inputs A and B are different, the output X is 1."

(a) Explain, using the circuit in Fig. 6, whether the engineer is correct. **[3]**

Total for this worksheet: 21 marks