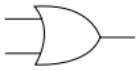
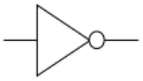
2.4 – Boolean Logic – Past Exam Questions

2.4.1 Boolean logic

- ☐ Simple logic diagrams using the operators AND, OR and NOT
- ☐ Truth tables
- ☐ Combining Boolean operators using AND, OR and NOT
- ☐ Applying logical operators in truth tables to solve problems

Required

- ✓ Knowledge of the truth tables for each logic gate
- ✓ Recognition of each gate symbol
- ✓ Understanding of how to create, complete or edit logic diagrams and truth tables for given scenarios
- ✓ Ability to work with more than one gate in a logic diagram

Boolean Operators	Logic Gate Symbol
AND *(Conjunction)*	
OR *(Disjunction)*	
NOT *(Negation)*	

Truth Tables

AND			OR			NOT	
A	B	A AND B	A	B	A OR B	A	NOT A
0	0	0	0	0	0	0	1
0	1	0	0	1	1	1	0
1	0	0	1	0	1		
1	1	1	1	1	1		

Alternatives

- Use of other valid notation will be accepted within the examination, e.g. Using T/F for 1/0, or V for OR, etc.

2022

2 A fast food restaurant offers half-price meals if the customer is a student or has a discount card. The offer is not valid on Saturdays.

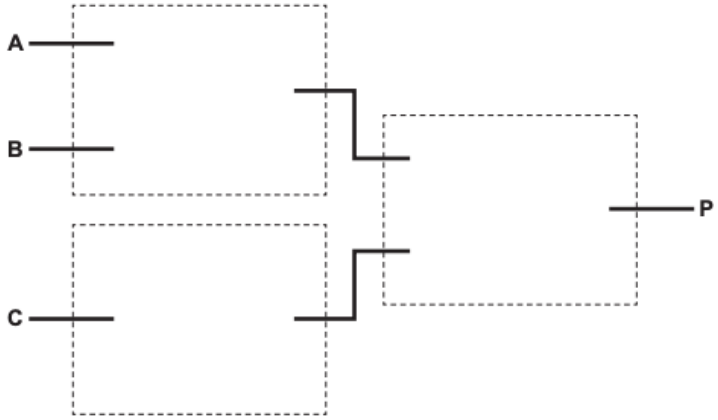
A computer system is used to identify whether the customer can have a half-price meal.

The table identifies the three inputs to the computer system:

Input	Value
A	Is a student
B	Has a discount card
C	The current day is Saturday

(a) The logic system **P = (A OR B) AND NOT C** is used.

(i) Complete the following logic diagram for **P = (A OR B) AND NOT C** by drawing one logic gate in each box.



[3]

(ii) A truth table can be produced for this logic circuit.

Describe the purpose of a truth table.

.....

.....

.....

..... **[2]**

(iii) State how many rows (excluding any headings) would be required in a truth table for the logic expression:

P = (A OR B) AND NOT C

..... **[1]**

Sample Paper

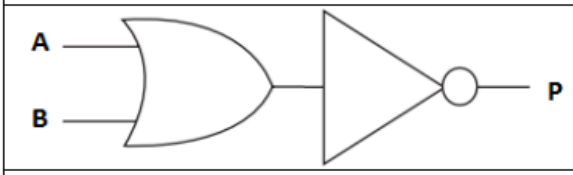
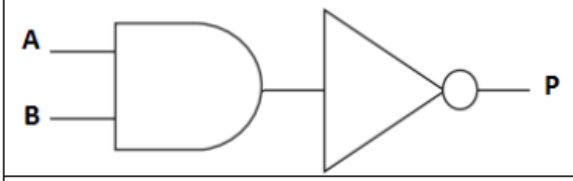
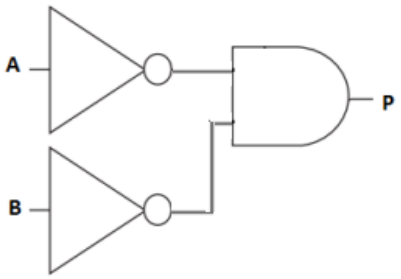
1 **(a)** Complete the truth table in **Fig. 1** for the Boolean statement **P = NOT (A AND B)**.

A	B	P
0	0	1
0	1	.....
1	0	.....
1	1	0

Fig. 1

[2]

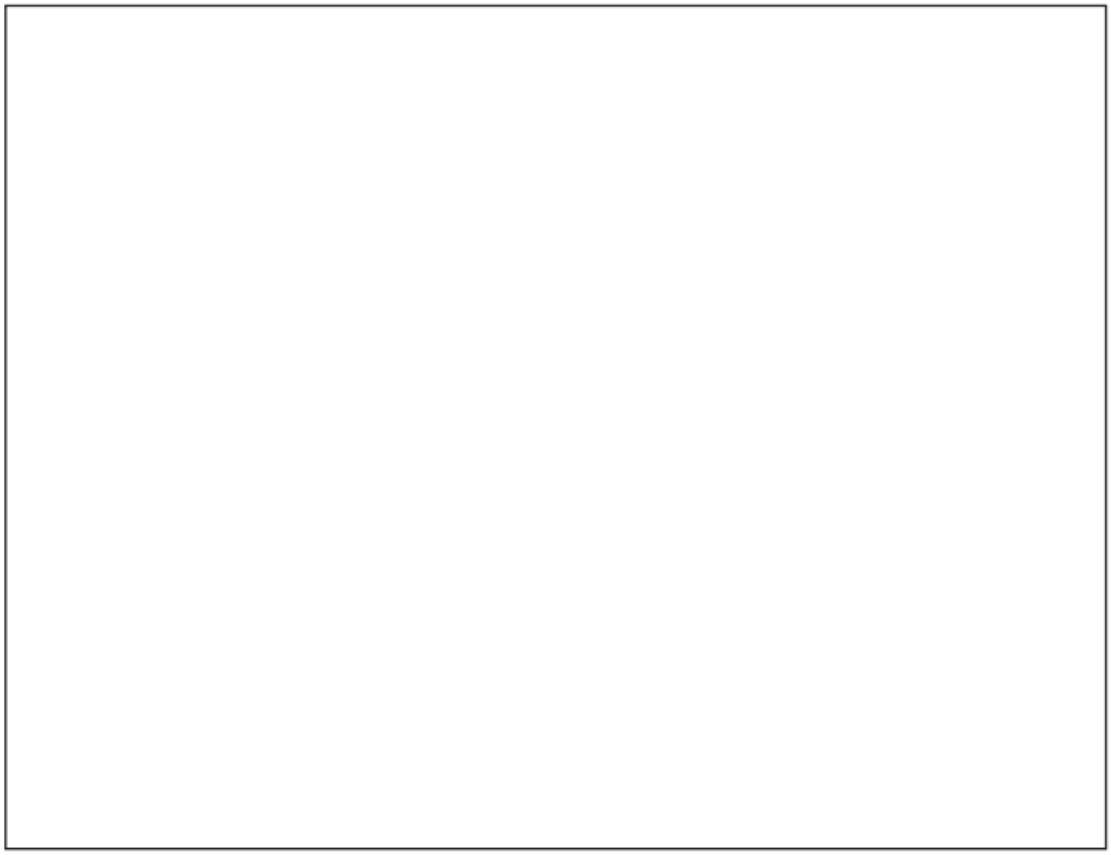
(b) Tick (✓) **one** box to identify the correct logic diagram for **P = NOT (A AND B)**.

P = NOT (A AND B)	Tick (✓) one box
	
	
	

[1]

2020

(f) **(i)** Draw the logic diagram for the logic system **P = A OR (B AND C)**



[3]

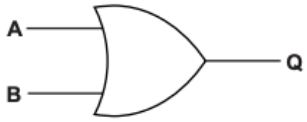
(ii) Complete the truth table for the logic system **P = NOT (A OR B)**

A	B	P
0	0	1
0	1	
1	0	

[4]

2019

(e) Complete the truth table for the following logic gate.



A	B	Q
0	0	0
0	1	1
	0	
1		

[4]

2018

3 The logic diagram below (Fig. 2) shows a system made up of two connected logic gates.

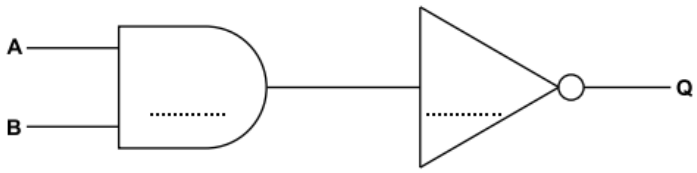


Fig. 2

(a) (i) Label the names of the two gates on the diagram above. **[2]**

(ii) Complete the truth table below to show the output from this logic system.

A	B	Q
0	0	
0	1	
1	0	
1	1	

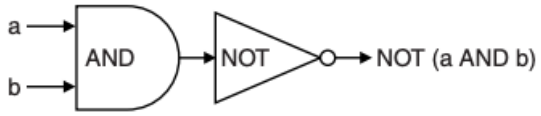
[4]

(b) Draw the logic diagram represented by **Q = A V ¬B**

2 marks

2014

7 The following logic diagram shows the expression NOT (a AND b).



Complete the missing boxes in the truth table below to show the value of NOT (a AND b) that will be output for each possible set of values of a and b.

a	b	NOT (a AND b)
0	0	1
0		1
1	0	

[4]