Chhetri Academy

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GCSE COMPUTER SCIENCE

2.4

OCR J277 | Specification point 2.4.1

Boolean logic

Untiered

Past paper question booklet

5	2014-2024	Untiered
question groups	available papers	tier

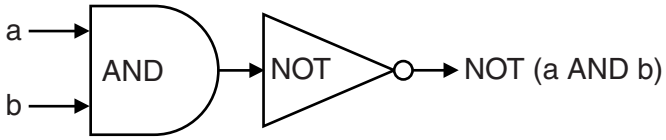
Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

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]

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

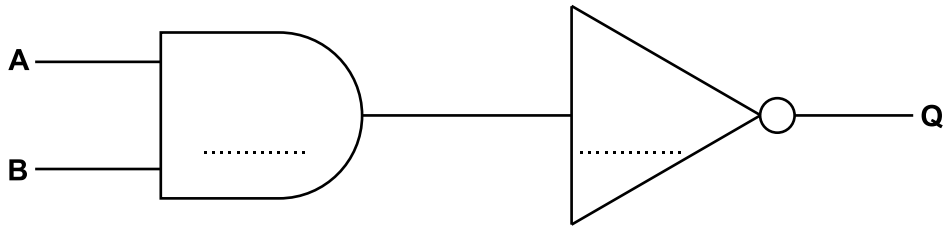


Fig. 2

(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 ∨ ¬B**

[2]

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Turn over

4 **(a)** Convert the binary value **1110 0011** into hexadecimal.

.....

.....

.....

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

(b) Convert the denary value **105** into an 8 bit binary number.

.....

.....

.....

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

(c) Give **two** reasons why computer scientists use hexadecimal to represent numbers instead of binary.

1 .....

.....

2 .....

.....

[2]

(d) `DIV` and `MOD` are both operators used in computing-related mathematics.

(i) State the value of `13 DIV 4`

.....

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

(ii) State the value of `13 MOD 4`

.....

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

(e) Show the outcome of a right shift of three places on the binary value 0111 1000

.....

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

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(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]

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.

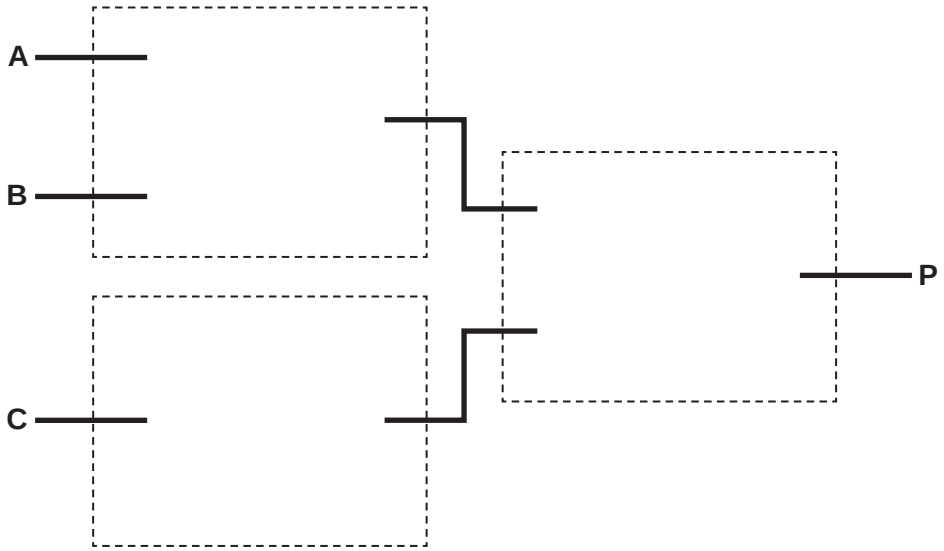
A computer system is used to identify whether the customer can have a half-price meal.

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]**

(b) The restaurant needs an algorithm designing to help employees work out if a customer can have a half price meal or not. It should:

- input required data
- decide if the customer is entitled to a discount
- output the result of the calculation.

Design the algorithm using a flowchart.

[5]

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(c) The restaurant adds a service charge to the cost of a meal depending on the number of people at a table. If there are more than five people 5% is added to the total cost of each meal.

Customers can also choose to leave a tip, this is optional and the customer can choose between a percentage of the cost, or a set amount.

Identify **all** the additional inputs that will be required for this change to the algorithm.

.....

.....

.....

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

(d) Each member of staff that works in the restaurant is given a Staff ID. This is calculated using the following algorithm.

```
01  surname = input("Enter surname")
02  year = input("Enter starting year")
03  staffID = surname + str(year)
04  while staffID.length < 10
05       staffID = staffID + "x"
06  endwhile
07  print("ID " + staffID)
```

(i) Define the term **casting and** give the line number where casting has been used in the algorithm.

Definition .....

.....

Line number .....

[2]

(ii) Complete the following trace table for the given algorithm when the surname “Kofi” and the year 2021 are entered.

You may not need to use all rows in the table.

Line number	surname	year	staffID	Output
01	Kofi			
02		2021		

[4]

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5

(a) Complete the truth table for **P = (A AND B) OR C**

A	B	C	P
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]

(b) Draw a logic circuit for **P = NOT A AND (B OR C)**



[3]