1(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)**

A

B

P

C

[3]

2(a). A computer game uses a controller with three inputs, **A**, **B** and **C**.

An action **P** is carried out if the player presses **A** with either **B** or **C** at the same time.

Draw the logic system for **P**.

A

B

P

C

[3]

(b). Complete the truth table for **P = NOT A OR (B AND C)**.

A	B	C	P
0	0	0	
0	0	1	
0	1	0	
0	1	1	
	0	0	
	0	1	
	1	0	
	1	1	

[3]

3(a). A garden floodlight system uses inputs from sensors and switches to decide whether it should be turned on. The table shows the inputs into the system and the meaning of each input value:

Letter	Input device	Input of 1	Input of 0
A	Motion sensor	Motion is detected	Motion is not detected
B	Light sensor	Light levels indicate it is daytime	Light levels indicate it is nighttime
C	Light switch	The switch is turned on	The switch is turned off

The floodlight (Q) is designed to be on (Q = 1) when the switch is turned on and the motion sensor detects motion at nighttime.

Draw a logic diagram for the floodlight.

[3]

(b). Identify the logic gates for truth table 1 and truth table 2.

Truth table 1:

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	1

Logic gate 1: ....

Truth table 2:

A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1

Logic gate 2: ....

[2]

4. 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.
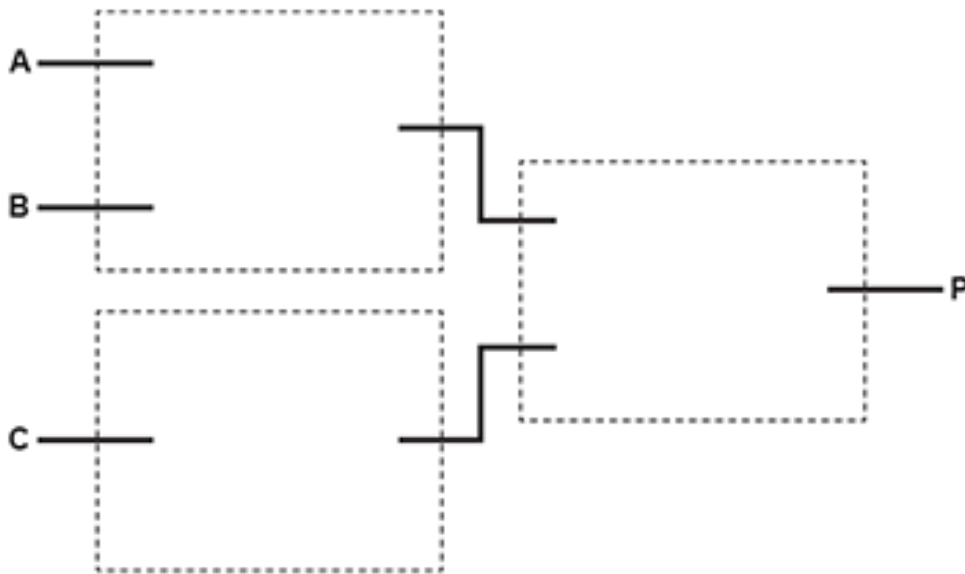
A computer system is used to identify whether the customer can have a half-price meal.

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

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]

5. 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]

6. A cinema uses the following criteria to decide if a customer is allowed to see a film that has a 15 rating:

Customers have to be 15 years of age or older to see the film. They also need to either have a ticket or have the money to buy a ticket.

The table shows the inputs to the system that will output whether the customer can watch the film.

Input	Criteria (True / False)
A	The customer is 15 or over
B	The customer has a ticket
C	The customer has the money to buy a ticket

Draw this system using logic gates.

[2]

END OF QUESTION PAPER