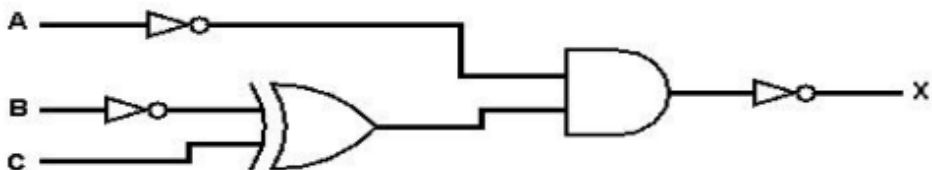


MARKING SCHEME FOR LOGIC CIRCUITS

1.

1(a)	1 mark for: (A XOR B) NOR C	1
1(b)	1 mark for NOT B XOR C 1 mark for NOT A and final AND plus NOT 	2

2.

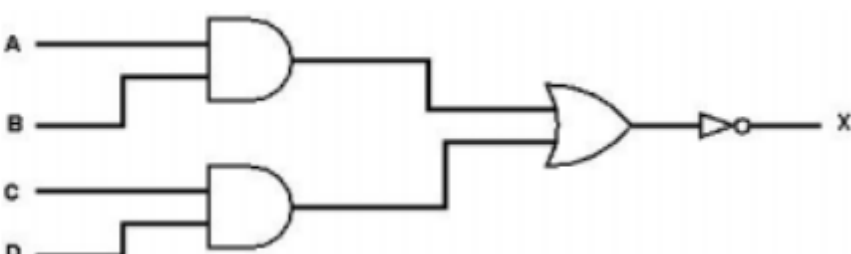
(c)(ii)

1 mark for each row:

4

Statement	Answer
The two types of logic gate that can be used to create solid state devices	NAND NOR
The number of transistors contained in each cell	2
The type of gate that can retain electrons without power	floating
The type of gate that allows or stops current from passing through	control

3.

(a)	1 mark for each correct answer: <i>NAND</i> - The output is 0 when both inputs are 1, otherwise the output is 1 <i>NOR</i> - The output is 1 when both inputs are 0, otherwise the output is 0 <i>XOR</i> - The output is 1 when one of the inputs is 1 and the other input is 0, otherwise the output is 0 <i>OR</i> - The output is 0 when both inputs are 0, otherwise the output is 1	4
(b)	1 mark for both AND gates with correct inputs 1 mark for correct OR and NOT gates with correct inputs and no superfluous gates: 	2

4.

1 mark for each correct line:

3

Truth table				Logic expression
A	B	C	X	NOT (A XOR B) AND C
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	0	
A	B	C	X	(A OR C) AND NOT B
0	0	0	0	
0	0	1	1	
0	1	0	0	
0	1	1	0	
1	0	0	0	
1	0	1	0	
1	1	0	0	
A	B	C	X	A NAND B NAND C
0	0	0	0	
0	0	1	1	
0	1	0	0	
0	1	1	0	
1	0	0	0	
1	0	1	0	
1	1	0	0	
A	B	C	X	(A NAND B) OR C
0	0	0	1	
0	0	1	1	
0	1	0	1	
0	1	1	1	
1	0	0	1	
1	0	1	1	
1	1	0	0	
A	B	C	X	NOT (A AND B AND C)
0	0	0	0	
0	0	1	1	
0	1	0	0	
0	1	1	0	
1	0	0	0	
1	0	1	0	
1	1	0	0	

5.

(a)

1 mark for each shaded part.

2

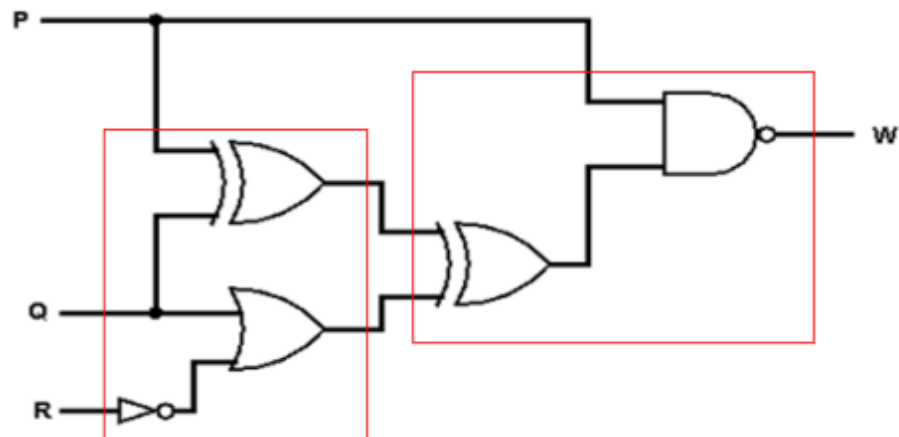
A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

(b)

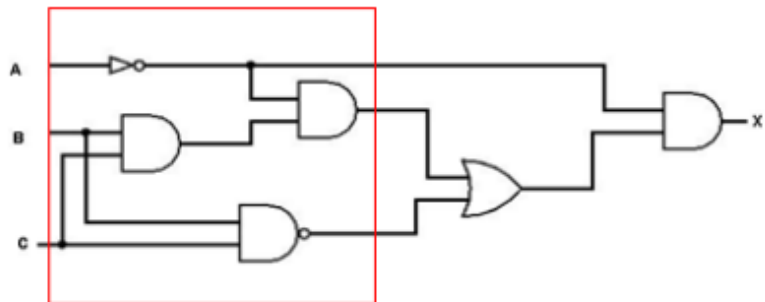
1 mark for (P XOR Q) and (Q OR NOT R)

1 mark for second XOR gate and final NAND gate with appropriate inputs

2

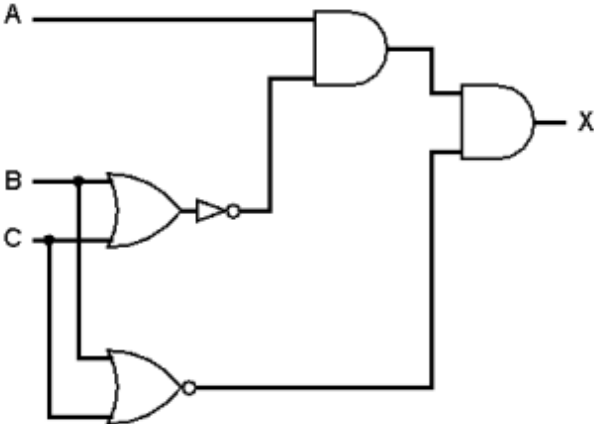


6.

(a)	1 mark for: Output is only 1 if one input is 1 and the other is 0 // Output is only 1 if both inputs are different // Output is only 0 if both inputs are the same	1
(b)	1 mark each: • $((A \text{ NOR } B) \text{ AND } (A \text{ OR } B))$ • $\text{NAND } (B \text{ AND } C)$ $X = ((A \text{ NOR } B) \text{ AND } (A \text{ OR } B)) \text{ NAND } (B \text{ AND } C)$	2
(c)	1 mark for NOT gate, 2 correct AND gates and the NAND gate 1 mark for OR gate and the final AND gate 	2

7.

l(a)	1 mark for each set of 4 rows (shaded)	2																																				
<table><tr><th>A</th><th>B</th><th>C</th><th>X</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>			A	B	C	X	0	0	0	1	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0	1	1	0	1	0	1	1	0	1	1	1	1	1
A	B	C	X																																			
0	0	0	1																																			
0	0	1	0																																			
0	1	0	0																																			
0	1	1	0																																			
1	0	0	1																																			
1	0	1	0																																			
1	1	0	1																																			
1	1	1	1																																			

(b)	1 mark for both AND gates 1 mark for NOT gate <u>and</u> OR gate <u>and</u> NOR gate 	2
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8.

(a)	1 mark for each bullet point - A NAND B - NOT(B XOR C) - Final NAND $X = A \text{ NAND } B \text{ NAND } (\text{NOT}(B \text{ XOR } C))$	3																																				
(b)	1 mark for each set of rows (shaded) <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>X</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> </table>	A	B	C	X	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1	0	1	0	0	1	1	0	1	1	1	1	0	1	1	1	1	1	2
A	B	C	X																																			
0	0	0	0																																			
0	0	1	0																																			
0	1	0	1																																			
0	1	1	0																																			
1	0	0	1																																			
1	0	1	1																																			
1	1	0	1																																			
1	1	1	1																																			

9.

(a)

1 mark for each set of highlighted rows

2

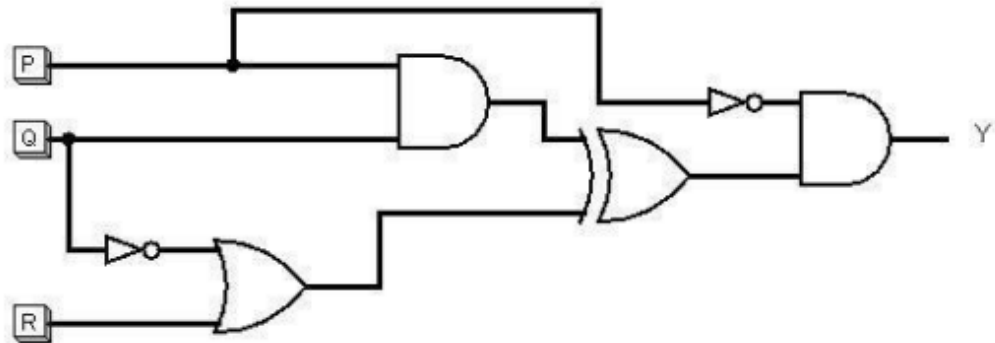
P	Q	R	Y
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

(b)

1 mark for P AND Q and NOT Q OR R

1 mark for NOT gate and AND gate and XOR gate

2



10.