# Computer Science

10. Boolean Logic

**Marking Scheme** 

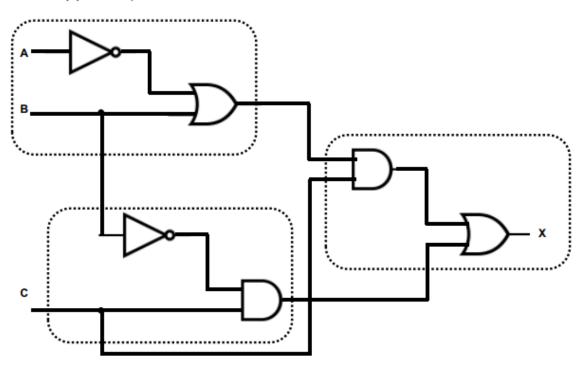
Q1)

(a)

A	В	С	Working	х	
0	0	0		1	1
0	0	1		0	] 1 mark
0	1	0		0	1
0	1	1		0	] 1 mark
1	0	0		0	1
1	0	1		1	] 1 mark
1	1	0		1	1
1	1	1		1	] 1 mark

[3]

#### (b) 1 mark per dotted section



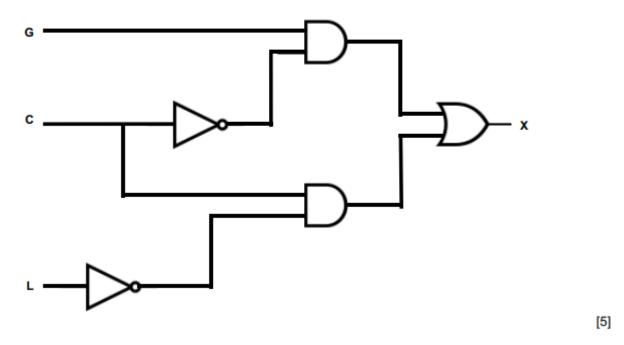
(c) X is 1 if:

accept equivalent ways of writing this:

e.g. 
$$(A OR B = 1)$$
 AND  $(B OR NOT C = 1)$ 

Q2)

(a) 1 mark per correct logic gate, correctly connected



(b)

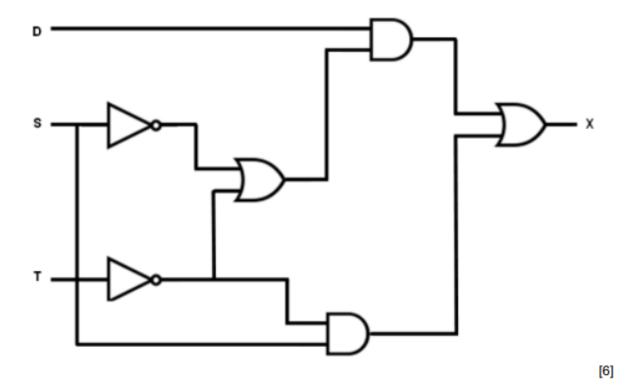
G	С	L	Workspace	x	
0	0	0		0	,
0	0	1		0	1 mark
0	1	0		1	1
0	1	1		0	1 mark
1	0	0		1	,
1	0	1		1	1 mark
1	1	0		1	,
1	1	1		0	1 mark

(c) 1 mark for correctly completed truth table

Α	В	С
0	0	0
0	1	1
1	0	1
1	1	0

Q3)

(a) 1 mark for each correct gate, with correct source of input(s)



(b)					
	D	s	Т	Working Space	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		0

4 marks for 8 correct X bits

[4]

<sup>3</sup> marks for 6 correct X bits

<sup>2</sup> marks for 4 correct X bits

<sup>1</sup> mark for 2 correct X bits

Q4)

(a)

Α	В	С	Working space	х
0	0	0		0
0	0	1		1
0	1	0		0
0	1	1		1
1	0	0		0
1	0	1		1
1	1	0		1
1	1	1		0

<sup>4</sup> marks for 8 correct X bits

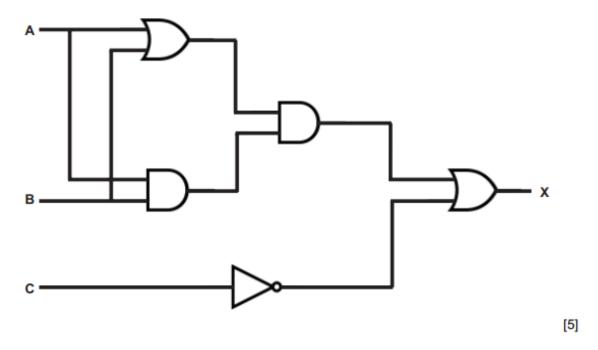
<sup>3</sup> marks for 6 correct X bits

<sup>2</sup> marks for 4 correct X bits

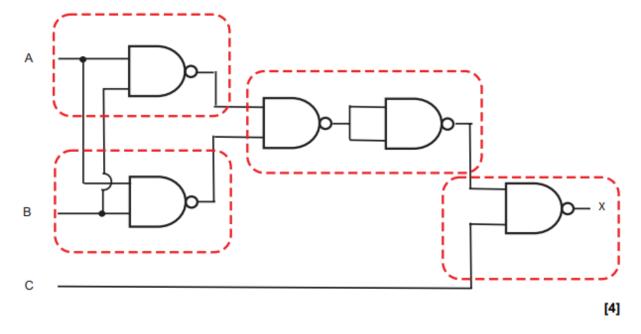
<sup>1</sup> mark for 2 correct X bits

Boolean Logic MS

(b) 1 mark for each correct gate with correct source of input

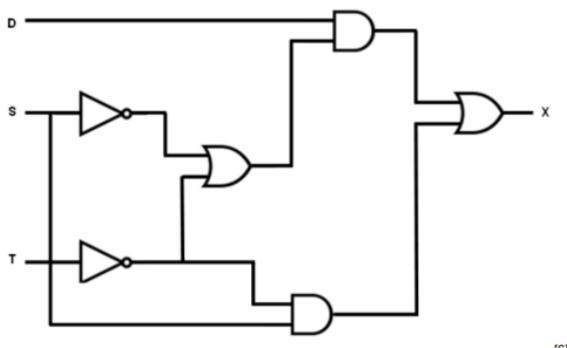


(c) Each dotted area is 1 mark



Q5)

(a) 1 mark for each correct gate, with correct source of input(s)



[6]

(b)					
	D	S	T	Working Space	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

<sup>4</sup> marks for 8 correct X bits

1

1

[4]

0

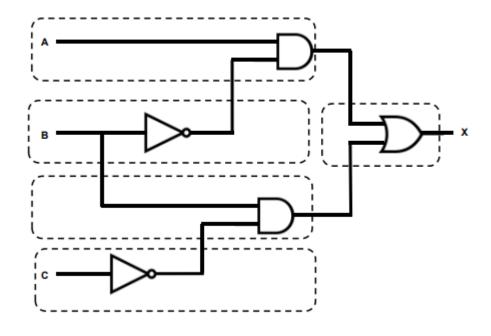
<sup>3</sup> marks for 6 correct X bits

<sup>2</sup> marks for 4 correct X bits

<sup>1</sup> mark for 2 correct X bits

Q6)

(a) 1 mark per correct section.



(b) 4 marks for 8 correct values 3 marks for 6 correct values 2 marks for 4 correct values 1 mark for 2 correct values

Α	В	С	Working space	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		0

[4]

[5]

Q7)

(a) (i) 2 marks for 4 correct outputs, 1 mark for 2 correct outputs

1 mark for correct gate

A	В	Working space	X
0	0		0
0	1		0
1	0		0
1	1		1

AND gate

[3]

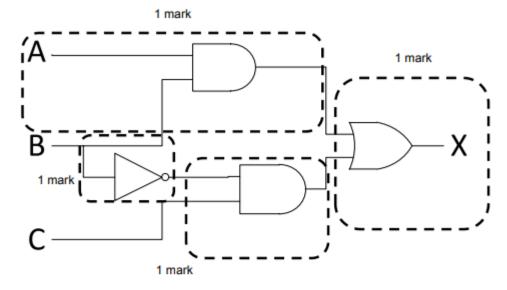
(ii) 2 marks for 4 correct outputs 1 mark for 2 correct outputs

1 mark for correct gate

Α	В	Working space	X
0	0		0
0	1		1
1	0		1
1	1		1

**OR** gate

(b)(i) 1 mark per correct section.



(ii) 4 marks for 8 correct outputs 3 marks for 6 correct outputs 2 marks for 4 correct outputs 1 mark for 2 correct outputs

Α	В	С	Working space	X
0	0	0		0
0	0	1		1
0	1	0		0
0	1	1		0
1	0	0		0
1	0	1		1
1	1	0		1
1	1	1		1

[4]

Q8)

Question	Answer					Marks
(a)	1 mark for four correct outputs only					
		Α	В	Output		
		0	0	1		
		0	1	0		
		1	0	0		
		1	1	0		
(b)	1 mark for each correct section of the statement				3	
	∞ (A AND B) ∞ AND ∞ (C OR NOT B)					

Q9)

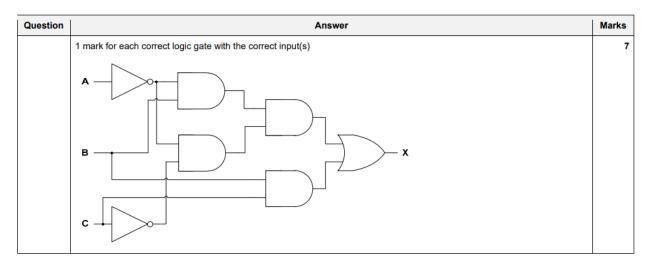
Question	Answer					Marks		
(a)	1 mark for each	1 mark for each correct gate, with the correct input(s)						
	А —	A B						
/(b)		_		l <b>v</b>		4		
	A	В	С	X				
	0	0	0	0	4			
	0	0	1	0				
	0	1	0	1				
	0	1	1	0				
	1	0	0	0				
	1	0	1	0				
	1	1	0	1	]			
	1	1	1	1				
	3 marks for 6 2 marks for 4	correct outputs or 7 correct ou or 5 correct ou r 3 correct outp	tputs tputs					

### Q10)

Question	Answer							
(a)	1 mark for each correct logic gate	4						
	BX							

Question	Answer	Marks
(b)	Any four from:  - similar to an OR gate - It has (at least) two inputs - Output will be high/1 if both inputs are different - Output will be high/1 if either input is high - Output will be low/0 if both inputs are high - Output will be low/0 if both inputs are low	5

## Q11)



### Q12)

Question	Answer	Marks
(a)	1 mark for each correct logic gate (with the correct direction of input(s))	6
	B C	

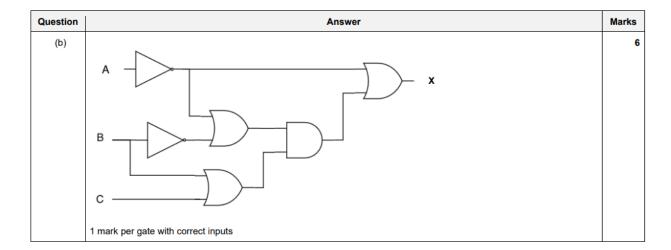
	1						Marks					
Question	Answer											
(b)	4 marks for 8 correct outputs 3 marks for 6 or 7 correct outputs 2 marks for 4 or 5 correct outputs 1 mark for 2 or 3 correct outputs											
	Α	В	С	Working space	X	]						
	0	0	0		1							
	0	0	1		1							
	0	1	0		1							
	0	1	1		1							
	1	0	0		0							
	1	0	1		1							
	1	1	0		1							
	1	1	1		1							

### Q13)

Question				Answer	Marks		
(a)	1 mark for each correct logic gate with correct direct of input(s):						
	А - В -			x			
(b)	3 mar 2 mar	ks for ks for	6 or 7 4 or 5	rect outputs ' correct outputs is correct outputs correct outputs	4		
	A	В	С	Working space X			
	0	0	0	1			
	0	0	1	1			
	0	1	0	0			
	0	1	1	0			
	1	0	0	1			
	1	0	1	1			
	1	1	0	0			
	1	1	1	0			

#### Q14)

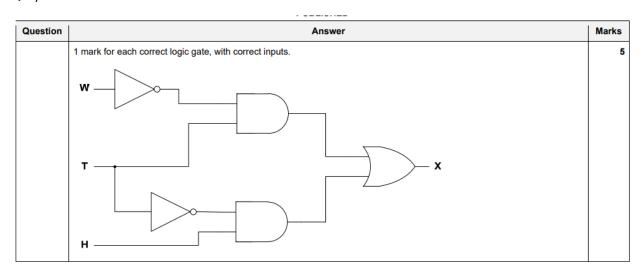
Question	Answer								
(a)	Α	В	С	X		4			
	0	0	0	1					
	0	0	1	1					
	0	1	0	0					
	0	1	1	1					
	1	0	0	0					
	1	0	1	1					
	1	1	0	1					
	1	1	1	1					
	All 8 for 4 6 or 7 for 4 or 5 for 2 or 3 for	3 marks 2 marks							



### Q15)

Question					Answer			Marks	
(a)	<ul> <li>4 marks for 8 correct outputs</li> <li>3 marks for 6 or 7 correct outputs</li> <li>2 marks for 4 or 5 correct outputs</li> <li>1 mark for 2 or 3 correct outputs</li> </ul>								
		A	В	С	Working space	X			
		0	0	0		1			
		0	0	1		1			
		0	1	0		1			
		0	1	1		1			
		1	0	0		0			
		1	0	1		1			
		1	1	0		1			
		1	1	1		1			
(b)	Three from:  output of AND is 1 if both inputs are 1  output of AND is 0 if either or both inputs are 0  output of OR is 1 if either input is 1  output of OR is 0 if both inputs are 0  correct example of AND truth table  correct example of OR truth table								

#### Q16)



### Q17)

			· ODLI			
Question			Ans	swer		Marks
(a)	4 marks for 8 correct outputs 3 marks for 6 or 7 correct outputs 2 marks for 4 or 5 correct outputs 1 mark for 2 or 3 correct outputs					4
		A	В	С	x	
		0	0	0	0	
		0	0	1	0	
		0	1	0	1	
		0	1	1	1	
		1	0	0	0	
		1	0	1	1	
		1	1	0	0	
		1	1	1	0	

Question Answer Marks

(b) 1 mark per correct gate with correct inputs.

A C C

### Q18)

Question	Answer	Marks
(a)	1 mark for correct name, 1 mark for correct gate symbol	2
	- AND	
(b)	1 mark for correct name, 1 mark for correct gate symbol	2
	- NOR	

Question	Answer	Marks
(c)	1 mark for correct name, 1 mark for correct gate symbol	2
	- NAND	

### Q19)

Question	Answer	Marks
	1 mark per each correct logic gate, with correct input(s)  A  B  C	6

Question	Answer									
(b)	4 marks for 8 correct of 3 marks for 6/7 correct 2 marks for 4/5 correct 1 mark for 2/3 correct of 1	t outpu t outpu	ıts ıts					4		
		A	В	С	Working space	x				
		0	0	0		0				
		0	0	1		0				
		0	1	0		1				
		0	1	1		0				
		1	0	0		0				
		1	0	1		0				
		1	1	0		1				
		1	1	1		1				

### Q20)

Question	Answer	Marks
(a)	1 mark for each correct logic gate, with correct inputs:	4
	B x	

Question				Answer			Marks
(b)	3 mark 2 mark	s for 6/3 s for 4/5	correct outp 7 correct ou 5 correct ou correct out	atputs atputs			4
	A	В	С	Working space	X		
	0	0	0		0		
	0	0	1		0		
	0	1	0		1		
	0	1	1		0		
	1	0	0		1		
	1	0	1		0		
	1	1	0		1		
	1	1	1		0		
(c)	Two fro	om:					2
	- - -	To con	trol the flow	cal operation of electricity through a logic circuit and the logic of the gate is applied to give	an output // t	o alter the output from given inputs	

### Q21)

Question				Answer	Marks
(a)	Input A	Input B	Output		1
	0	0	0		
	0	1	1		
	1	0	1		
	1	1	1		
(b)	∝ Exclus	ive OR / XC	OR / EOR		1
(c)	One mark t	or each co	rect logic g	ate with correct inputs	5
	P	>,-		x	
(d)	<ul><li>∞ Avoids</li><li>∞ It could</li><li>∞ Detect</li></ul>	errors insta	or erous envir antly	onment and will avoid human risk	2

### Q22)

Question	Answer	Marks
(a)	$\infty$ X = 1 if (A is 1 XOR C is 1) OR (B is 1 NAND C is NOT 1) $\infty$ X = (A XOR C) OR (B NAND NOTC)	3
	One mark for each bullet:           ∞ (A XOR C)           ∞ OR           ∞ (B NAND NOTC)	

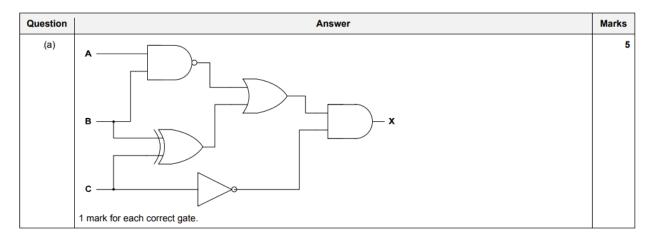
Question				Ansv	wer	
(b)	Three Two r	mark marks	s for 6	correct outputs 6 or 7 correct outputs or 5 correct outputs r 3 correct outputs		
	A	В	С	Working space	x	
	0	0	0		1	
	0	0	1		1	
	0	1	0		0	
	0	1	1		1	
	1	0	0		1	
	1	0	1		1	
	1	1	0		1	
	1	1	1		1	

### Q23)

Question	Answer	Marks
(a)	One mark for each correct logic gate with correct input(s)	4
	T X	

Question				Answer			Marks
(b)	Three Two m	marks f ark for	or 6 or 4 or 5 c	ct outputs 7 correct outputs orrect outputs orrect outputs			4
	A	Т	Р	Working space	X		
	0	0	0		0		
	0	0	1		1		
	0	1	0		0		
	0	1	1		0		
	1	0	0		0		
	1	0	1		1		
	1	1	0		1		
	1	1	1		1		
(c)	∞ Sig ∞ Re ∞ Mi ∞ If v ∞	ensor segnal/rea gnal/rea eading/o croproc value is a signa	ading/da data is s essor c greater al/data is	ignal/reading/data to the microprocessor ta is analogue and is converted to digital using ADC tored in the system ompares data/reading to the pre-set value of 7 than 7 sent by the microprocessor to display a warning montinuous		e on a monitor	6

### Q24)



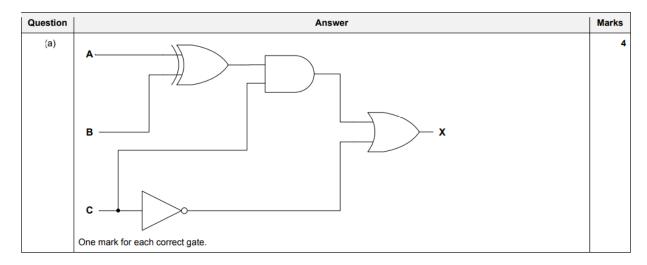
Question					Answer			Marks
(b)	Γ	Α	В	С	Working space	X		4
		0	0	0		1		
		0	0	1		0		
		0	1	0		1		
		0	1	1		0		
		1	0	0		1		
		1	0	1		0		
		1	1	0		1		
		1	1	1		0		
	4 marks for 8 correct or 3 marks for 6 or 7 correct 2 marks for 4 or 5 correct 1 mark for 2 or 3 correct	ect out ect out	puts puts				,	

### Q25)

Question	Answer	Marks
(a)(i)	- NAND	2
(a)(ii)	- NOR	2

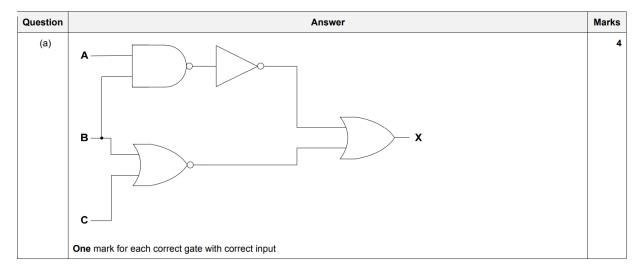
Question					Answer		Marks
·(b)		Α	В	С	Working space	X	4
		0	0	0		0	
		0	0	1		0	
		0	1	0		1	
		0	1	1		1	
		1	0	0		0	
		1	0	1		0	
		1	1	0		1	
		1	1	1		1	
	4 marks for 8 correct out 3 marks for 6 or 7 correct 2 marks for 4 or 5 correct 1 mark for 2 or 3 correct	outpu	ts		•		

### Q26)



Question				Answer		Marks
(b)	Α	В	С	Working space	X	4
	0	0	0		1	
	0	0	1		0	
	0	1	0		1	
	0	1	1		1	
	1	0	0		1	
	1	0	1		1	
	1	1	0		1	
	1	1	1		0	

### Q27)



Question				Ans	swer		
(b)	Three	mark marks	s for 6	correct outputs 6/7 correct outputs 5 correct outputs correct outputs			
	A	В	С	Working space	х		
	0	0	0		1	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		

Question					Answer	Marks
(c)	One mark for the correct gate and one mark for the correct truth table					
	_	AND				
		Α	В	X		
		0	0	0		
		0	1	0		
		1	0	0		
		1	1	1		
		VOD				
	-	XOR A	В	X		
		0	0	0		
		0	1	1		
		1	0	1		
		1	1	0		

### Q28)

Question	Answer	Marks
(a)	One mark for each correct logic gate with correct input:	4
	B X	

Question				Ans	wer	N.	Marks		
(b)	Four marks for 8 correct outputs Three marks for 6/7 correct outputs Two marks for 4/5 correct outputs One mark for 2/3 correct outputs								
	Α	В	С	Working space	х				
	0	0	0		0				
	0	0	1		1				
	0	1	0		0				
	0	1	1		1				
	1	0	0		0				
	1	0	1		1				
	1	1	0		1				
	1	1	1		1				

### Q29)

Boolean Logic MS

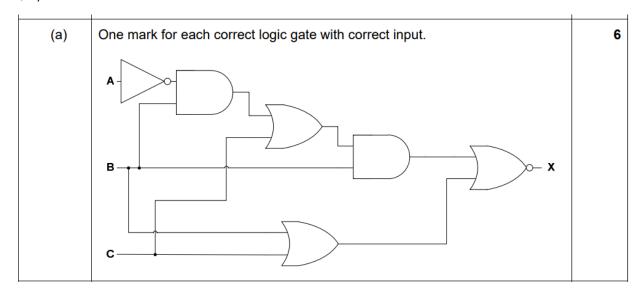
Question	Answer	Marks
(a)	One mark for each correct logic gate with the correct input:	4
	B X	

Question				An	swer		
	Three Two	ur marks for 8 correct outputs ree marks for 6/7 correct outputs o marks for 4/5 correct outputs le mark for 2/3 correct outputs					
	Α	В	С	Working space	x		
	0	0	0		0		
	0	0	1		1		
	0	1	0		1		
	0	1	1		0		
	1	0	0		1		
	1	0	1		1		
	1	1	0		1		
	1	1	1		1		

### Q30)

Question	Answer	Marks
(a)	One mark per each correct logic gate, with correct input:  A  B  C	6
(b)	- Row 1 - Row 3 - Row 4 - Row 5	4

Q31)



Question	Answer	Marks
/(b)	One mark per each correct row.  - Row 2  - Row 3  - Row 7  - Row 8	4

#### Q32)

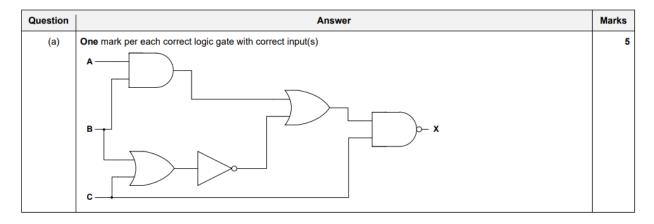
Question	Answer	Marks
(a)	<ul><li>AND</li><li>NOR</li><li>XOR</li></ul>	3
(b)	<ul> <li>Row 1</li> <li>Row 4</li> <li>Row 7</li> <li>Row 8</li> </ul>	4

Q33)

Question	Answer	Marks
(a)	One mark per each correct logic gate with the correct input(s).	5
	B X	
(b)	One mark per logic gate name and one mark per correct drawing.	2
	- NAND	
	- NOR	

Question				Answer		Marks
(c)	A	В	С	Working space	x	4
	0	0	0		0	
	0	0	1		0	
	0	1	0		0	
	0	1	1		1	
	1	0	0		0	
	1	0	1		1	
	1	1	0		0	
	1	1	1		1	
	3 mark 2 mark	s per 6/ s per 4/	7 corre	outputs ct outputs ct outputs t outputs	·	

## Q34)



Question					Answer	Marks
(b)	4 marks for 8 correct of 3 marks for 6/7 correct 2 marks for 4/5 correct 1 mark for 2/3 correct of	outputs				4
		Α	В	С	Working space X	
		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	1	
		1	1	1	0	
(c)	- NOR - XOR / EOR					2

## Q35)

Boolean Logic MS

Question		Answer								
(a)		One mark per each correct logic gate with correct inputs								
	A		> > -[		- X					
(b)	2 marks	s for 6/3 s for 4/5	7 correct	outputs et outputs et outputs outputs		4				
	A	В	С	Working space	X					
	0	0	0		1					
	0	0	1		0					
	0	1	0		1					
	0	1	1		1					
	1	0	0		1					
	1	0	1		0					
	1	1	0		1					
	1	1	1		1					

## Q36)

Question	Answer	Marks
(a)	One mark for each correct logic gate with correct input(s)	6

Question					Answer	Marks
(b)	Four mark Three mark Two mark One mark	rks for 6/ s for 4/5	7 correct	t outputs outputs		4
		Α	В	С	Working space X	
		0	0	0	0	
		0	0	1	1	
		0	1	0	0	
		0	1	1	1	
		1	0	0	0	
		1	0	1	1	
		1	1	0	0	
		1	1	1	1	

## Q37)

Question				Answer		Marks					
(a)	One mark fo	mark for each correct logic gate with correct input(s)									
	В —		>								
(b)	Four marks Three mark Two marks One mark fo	s for 6/7 core for 4/5 corre	rrect outputs ect outputs			4					
	Α	В	С	Working space	X						
	0	0	0		0						
	0	0	1		0						
	0	1	0		0						
	0	1	1		1						
	1	0	0		0						
	1	0	1		0						
	1	1	0		0						
	1	1	1		1						

## Q38)

Answer									
One mark for each correct row				4					
Statement	AND (✓)	OR (✔)	XOR (✔)						
if both inputs are 0, the output is 0	1	1	1						
if both inputs are different, the output is 1		1	1						
if both inputs are 1, the output is 1	1	1							
if both inputs are the same, the output is always 0			1						
	One mark for each correct row  Statement  if both inputs are 0, the output is 0  if both inputs are different, the output is 1  if both inputs are 1, the output is 1	One mark for each correct row  Statement AND (✓)  if both inputs are 0, the output is 0  if both inputs are different, the output is 1  if both inputs are 1, the output is 1	One mark for each correct row  Statement  AND (*)  OR (*)  if both inputs are 0, the output is 0  if both inputs are different, the output is 1  if both inputs are 1, the output is 1	One mark for each correct row  Statement AND (✓) (✓) (✓) (✓)  if both inputs are 0, the output is 0  if both inputs are different, the output is 1  if both inputs are 1, the output is 1					

Question			Answer		Marks
(b)	One mark	for the correct name and <b>one</b> ma	rk for the correct truth table		4
	• NOR				
	[	A	В	Output	
		0	0	1	
		0	1	0	
		1	0	0	
		1	1	0	
	NANI	0			
		Α	В	Output	
		0	0	1	
		0	1	1	
		1	0	1	
		1	1	0	

## Q39)

Question	Answer	Marks
(a)	One mark for each correct logic gate with correct input(s)  A  B  C	6
(b)	Any <b>one</b> from:	1
	NOR     XOR // EOR	

Question					Answer		Marks
(c)	Four marks for 8 correct Three marks for 6/7 correct Two marks for 4/5 correct One mark for 2/3 correct	rect outpu	outs ts				4
		Α	В	С	Working space	х	
		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	
		1	1	1		1	

## Q40)

Question		Answer										
(a)	One mark for	each correc	ach correct row									
				Sta	atement	NAND (✔)	OR (✔)	XOR (✔)				
		if both input	s are 1,	the output	is 1		1					
		if both input	s are di	fferent fron	each other, the output is 1	1	1	1				
		if both input	s are 0,	the output	is 0		✓	1				
		if both input	s are th	e same as	each other, the output is always 0			✓				
. (b)	One mark for	a correct log	gic gate	, <b>one</b> mark	for a corresponding truth table					2		
	• AND			1								
		Α	В	Output								
		0	0	0								
		0	1	0								
		1	0	0								
		1	1	1								

## Q41)

Question	Answer	Marks
/(a)	One mark for each correct logic gate with the correct inputs	6

Question					Answer			Marks			
(b)	Four marks for 8 correct outputs Three marks for 6/7 correct outputs Two marks for 4/5 correct outputs One mark for 2/3 correct outputs										
		Α	В	С	Working space	X					
		0	0	0		1					
		0	0	1		0					
		0	1	0		1					
		0	1	1		1					
		1	0	0		0					
		1	0	1		1					
		1	1	0		0					
		1	1	1		0					

## Q42)

Question	Answer	Marks
)(a)	One mark for each correct gate, with the correct input(s) as shown.	4
	A B	

Question					Answer	Marks						
(b)	Three Two r	Four marks for eight correct outputs. Three marks for six or seven correct outputs. Two marks for four or five correct outputs. One mark for two or three correct outputs										
	Α	В	С	z								
	0	0	0	0								
	0	0	1	1								
	0	1	0	1								
	0	1	1	0								
	1	0	0	0								
	1	0	1	0								
	1	1	0	1								
	1	1	1	0								

## Q43)

Question		Answer	Marks
	One mark for each correct line		4
	Logic gate	Standard symbol	
	AND	<b>⊅</b> -	
	OR	_ <del>-</del> >	
	NAND	=D-	
		⊅	
	NOT	=D-	

## Q44)

Question				Ansv	er	N					
	3 marks for 6/7 of 2 marks for 4/5 of	marks for 8 correct outputs marks for 6/7 correct outputs marks for 4/5 correct outputs mark for 2/3 correct outputs									
	A	В	С	X							
	0	0	0	0							
	0	0	1	0							
	0	1	0	0							
	0	1	1	0							
	1	0	0	0							
	1	0	1	1							
	1	1	0	0							
	1	1	1	0							

## Q45)

Question	Answer	Marks
(a)	One mark for each correct gate, with the correct input(s) as shown.	4
	A —	

Question					Answer	Marks						
/(b)	Three Two	Four marks for eight correct outputs. Three marks for six or seven correct outputs. Two marks for four or five correct outputs. One mark for two or three correct outputs										
	Α	В	С	z								
	0	0	0	0								
	0	0	1	0								
	0	1	0	0								
	0	1	1	0								
	1	0	0	1								
	1	0	1	0								
	1	1	0	0								
	1	1	1	0								

## Q46)

Question	Answer	Marks
(a)	One mark for each point  NOT A  AND B  OR NOT C  expression correct (NOT A AND B) OR NOT C	4

Question					Answer	Marks
.'(b)	Α	В	С	х		4
	0	0	0	1		
	0	0	1	0		
	0	1	0	1		
	0	1	1	1		
	1	0	0	1		
	1	0	1	0		
	1	1	0	1		
	1	1	1	0		
	4 marks 3 marks 2 marks 1 mark	s for 6/7 s for 4/5	correct	t output: t output:	S	

Q47)

Question					Answer	Marks
(a)	One r	nark f	or eac	h corr	ect gate, with the correct input(s) as shown.	4
	А <b>—</b> В <b>—</b>		)     			
(b)	Three Two r	mark marks	s for s for for	six or s ur or fi	orrect outputs. seven correct outputs. ve correct outputs. ee correct outputs	4
	A	В	С	z		
	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		
	1	1	1	1		

## Q48)

Question				Answer	Marks						
(a)	One mark for correct gate and one mark for correct truth table  AND										
	AND										
	A	В	x								
	0	0	0								
	0	1	0								
	1	0	0								
	1	1	1								
(b)	One ma	ark for c	correct g	gate and <b>one</b> mark for correct truth table	2						
	XOR //	EOR									
	A	В	х								
	0	0	0								
	0	1	1								
	1	0	1								
	1	1	0								

Question				Answer	Marks			
`(c)	One mark for correct gate and one mark for correct truth table  NOR							
	A	В	x					
	0	0	1					
	0	1	0					
	1	0	0					
	1	1	0					
(d)	A -	ark for e	each con	rect gate, with the correct input(s) as shown.	5			

## Q49)

Question	Answer	Marks
(a)	One mark for each correct gate, with the correct input(s) as shown.	5

Question					Answer	Marks
)(b)	Four ma Three m Two man One man	arks for s rks for fo	six or sev ur or five	en correct o	ct outputs. outputs.	4
	R	s	Т	Z		
	0	0	0	1		
	0	0	1	1		
	0	1	0	1		
	0	1	1	0		
	1	0	0	1		
	1	0	1	0		
	1	1	0	1		
	1	1	1	1		

## Q50)

Question		Answer	Marks								
	One mark for each correct line										
	Logic function	Standard symbol									
	AND	<b>→</b>									
	XOR	<b>-</b>  >>-									
		<del></del>									
	NAND	<b>#</b> D-									
	OR	<b>→</b>									

# Q51)

Question	Answer	Marks
(a)	X = 1 mark (A AND B) // A AND B 1 mark AND NOT C 1 mark	3
	X = (A AND B) AND NOT C	

Question	Answer									
(b)	Four marks for Three marks for Two marks for One mark for	for 6/7 correct or r 4/5 correct or	outputs utputs			4				
	A	В	С	x						
	0	0	0	0						
	0	0	1	0						
	0	1	0	0						
	0	1	1	0						
	1	0	0	0						
	1	0	1	0						
	1	1	0	1						
	1	1	1	0						

## Q52)

Question	Answer								
`(a)	One mark for each correct line	4							
	Logic gate symbol Logic function								
	AND								
	XOR								
	NOT								
	NAND								
	OR								

(b)					Answer	ı
	Α	В	С	z		
	0	0	0	0		
	0	0	1	1		
	0	1	0	0		
	0	1	1	0		
	1	0	0	1		
	1	0	1	0		
	1	1	0	0		
	1	1	1	0		

## Q53)

Question	Answer	Marks
(a)	One mark for each point  NOT X  Y XOR Z	3
	expression correct: NOT X OR (Y XOR Z) // (Y XOR Z) OR NOT X	

Question					Answer	Marks
(b)	3 ma 2 ma	rks fo rks fo	or 6/7 or 4/5	corre	t outputs ect outputs ect outputs ect outputs ct outputs	4
	x	Y	z	w		
	0	0	0	1		
	0	0	1	1		
	0	1	0	1		
	0	1	1	1		
	1	0	0	0		
	1	0	1	1		
	1	1	0	1		
	1	1	1	0		

Q54)

Question	Answer	Marks
(a)	One mark for each correct gate, with the correct input(s) as shown.	4

Question					Answer	Marks
(b)	Three Two	e marl marks	ks for fo	six or ur or	orrect outputs seven correct outputs five correct outputs ree correct outputs	4
	Р	Q	R	X		
	0	0	0	1		
	0	0	1	0		
	0	1	0	0		
	0	1	1	1		
	1	0	0	1		
	1	0	1	1		
	1	1	0	0		
	1	1	1	1		

## Q55)

