



Name: _____

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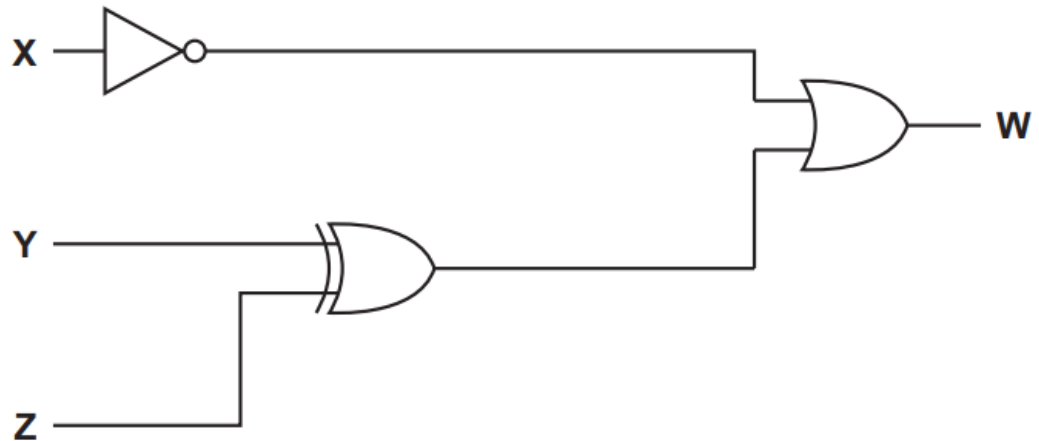
Reg.no.: _____

Class: _____

Date: _____

November 2024 (21)

7 Consider the logic circuit:



- (a) Write a logic expression for the given logic circuit. Do **not** attempt to simplify the logic expression.

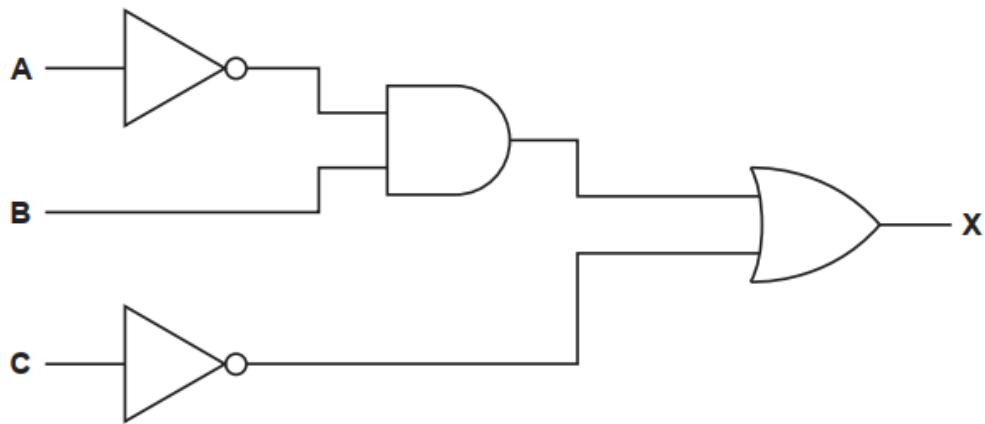
W =
..... [3]

- (b) Build a truth table and complete the truth table.

[4]



7 Consider this logic circuit.



(a) Write a logic expression for this logic circuit. Do **not** attempt to simplify this logic expression.

X =

..... [4]

(b) Build a truth table and complete the truth table.

[4]

November 2023 (23)

- 6** There are **three** descriptions of logic gates. Each logic gate has two inputs **A** and **B** with one output **X**.
Identify each logic gate.
Complete a truth table for each logic gate.

- (a)** The only time the output is 1 is when both inputs are 1.

Logic gate

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

- (b)** The output is 1 when both inputs are different.

Logic gate

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

- (c)** The only time the output is 1 is when both inputs are 0.

Logic gate

Complete the truth table for this description.

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]



(d) Consider this logic expression:

$$X = (\text{NOT } A \text{ OR NOT } B) \text{ OR NOT } C$$

Draw a logic circuit for this logic expression. Each logic gate must have a maximum of **two** inputs. Do **not** attempt to simplify this logic expression.



[5]

9 Consider this logic expression:

$$Z = (A \text{ NAND } B) \text{ XOR } (\text{NOT } (\text{NOT } B \text{ NAND } C))$$

(a) Draw a logic circuit for this logic expression.

Each logic gate must have a maximum of **two** inputs.

Do **not** simplify the logic expression.



[5]

(b) Complete the truth table from the given logic expression.

A	B	C	Working space	Z
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]

7 Consider the truth table:

A	B	C	X
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	1

- (b) Write a logic expression for the given truth table.
Do **not** simplify the logic expression.

.....

.....

.....

.....

.....

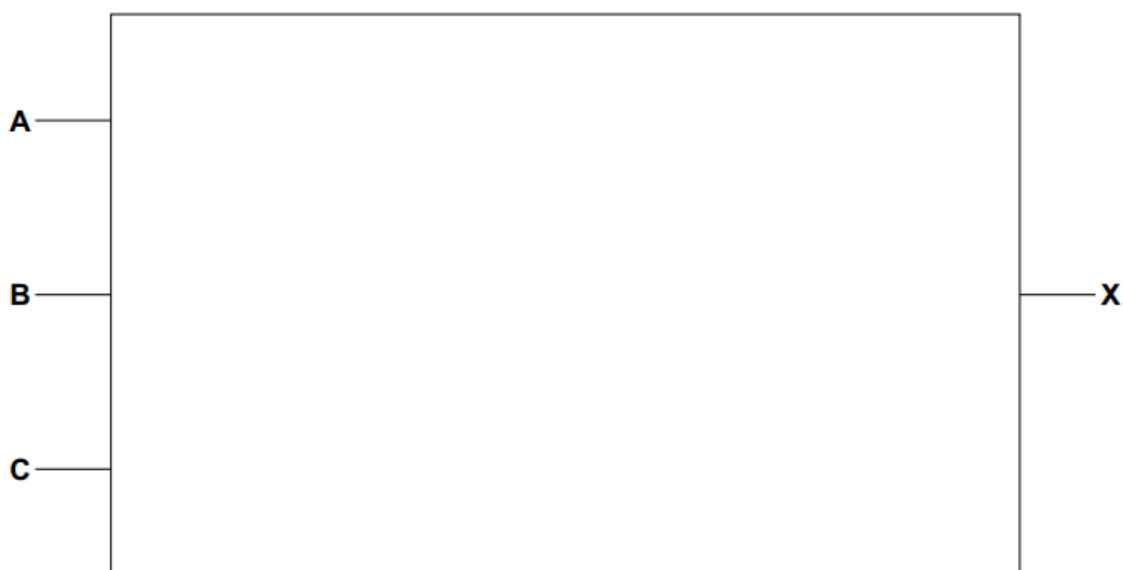
.....

..... [3]

- (a) Draw a logic circuit to represent the given truth table.

Each logic gate should have maximum of **two** inputs.

Do **not** simplify the logic circuit.



[6]

5 Computers use logic gates.

(a) State the **single** logic gate that produces each truth table.

Truth table			Logic gate
A	B	Output	
0	0	1	
0	1	1	
1	0	1	
1	1	0	
A	B	Output	
0	0	0	
0	1	1	
1	0	1	
1	1	0	
A	B	Output	
0	0	1	
0	1	0	
1	0	0	
1	1	0	

[3]

(b) An aeroplane has a warning system that monitors the height of the aeroplane above the ground, whether the aeroplane is ascending or descending, and the speed of the aeroplane.

Input	Binary value	Condition
Height (H)	1	Height is less than 500 metres
	0	Height is greater than or equal to 500 metres
Ascending or Descending (A)	1	Aeroplane is ascending or in level flight
	0	Aeroplane is descending
Speed (S)	1	Speed is less than or equal to 470 knots
	0	Speed is greater than 470 knots

The warning system will produce an output of 1 that will sound an alarm (W) when either of these conditions apply:

Height is less than 500 metres and the aeroplane is descending

or

The aeroplane is descending and speed is greater than 470 knots

Draw a logic circuit to represent the warning system.



November 2024 (23)

- 8 A logic circuit is to be built to control the automatic opening of a window. The window **W** opens if the temperature **T** is too high, the heater **H** is off, and the air conditioning **A** is off.

air conditioning A	air conditioning off	0
	air conditioning on	1
temperature T	not too high	0
	too high	1
heater H	heater off	0
	heater on	1
window W	window closed	0
	window open	1

Complete the truth table for this problem.

A	T	H	W
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]



- 8 (a) Draw the symbol for an XOR logic gate **and** complete the truth table for it.

XOR logic gate symbol:



Truth table:

A	B	X
0	0	
0	1	
1	0	
1	1	

[2]

- (b) Consider the logic rules in the following table:

Input	Binary value	Description
A	0	operator not present
	1	operator present
B	0	ignition key present
	1	ignition key not present
C	0	operator code correct
	1	operator code not correct

A crane is a machine with a long arm used to lift heavy objects. The crane will only move:

- if the operator is present and
- either the ignition key is present, or the operator code is correct.

The crane moving is represented by **X = 1**.

(i) Write the logic expression for the crane moving.

X = [2]

(ii) Complete the truth table for the crane moving.

A	B	C	Working space	X
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]