GHANA COMMUNICATION
TECHNOLOGY UNIVERSITY

INSTITUTE OF CONTINUING
AND DISTANCE EDUCATION (ICDE)

COURSE CODE	CIIS 154
COURSE TITLE	Digital Electronics
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QUESTION:

a) Truth tables for all seven gates

b) Logic symbols for each gate

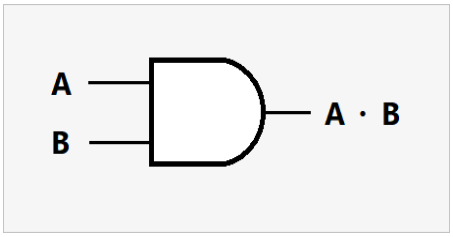
c) A short paragraph (3–4 sentences) explaining a practical application for each gate

SOLUTION

A logic gate (or electronic gate) is a circuit designed to process one or more binary signals to perform a specific logical operation.
It acts as a device that controls the flow of information, typically in the form of pulses. Logic gates are categorized into seven main types: AND, OR, NOT, NAND, NOR, XOR, and XNOR.

AND Gate

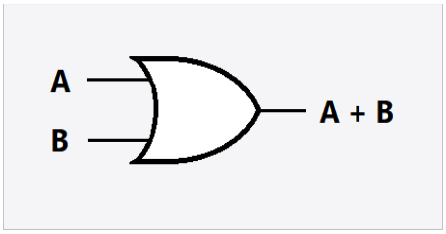
Outputs 1 only if **all** inputs are 1. A door with two locks — both locks must be unlocked for the door to open.



A (Input)	B (Input)	A AND B (Output)
0	0	0
0	1	0
1	0	0
1	1	1

OR Gate

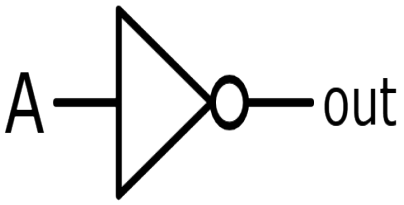
Outputs 1 if **at least one** input is 1. An office door that opens if you use either a keycard or enter the correct passcode.



A (Input)	B (Input)	A OR B (Output)
0	0	0
0	1	1
1	0	1

1	1	1

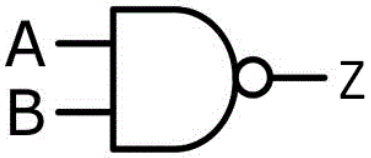
NOT Gate



Produces the **opposite** of the input (inverts it). A fridge light — it turns ON when the door is open and OFF when the door is closed.

A (Input)	B (Output)
1	0
0	1

NAND Gate

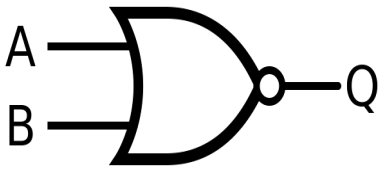


Outputs 0 only when **all** inputs are 1 (inverse of AND). A washing machine that stops only if both the lid is closed AND the timer is done. If not, it keeps running.

A (Input)	B (Input)	A NAND B (Output)
0	0	1
0	1	1

1	0	1
1	1	0

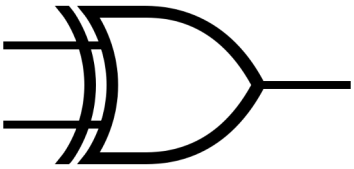
NOR Gate



Outputs 1 only when **all** inputs are 0 (inverse of OR). Security alarm that stays silent unless all motion sensors are OFF — if any detect movement, it sounds the alarm.

A (Input)	B (Input)	A NOR B (Output)
0	0	1
0	1	0
1	0	0
1	1	0

XOR Gate

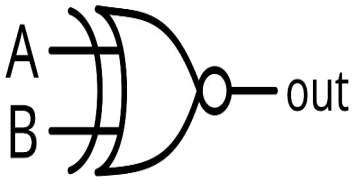


Outputs 1 only if **exactly one** input is 1.
A two-way lamp switch where the light changes state only when one switch is flipped — not both at the same time.

A (Input)	B (Input)	A XOR B (Output)
0	0	0
0	1	1
1	0	1

1	1	0

XNOR Gate



Outputs 1 when inputs are **the same** (inverse of XOR). A password checker — door unlocks only if the entered code matches the stored code

A (Input)	B (Input)	A XNOR B (Output)
0	0	1
0	1	0
1	0	0
1	1	1