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

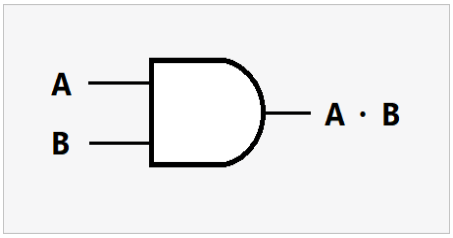
b) Logic symbols for each gate

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.

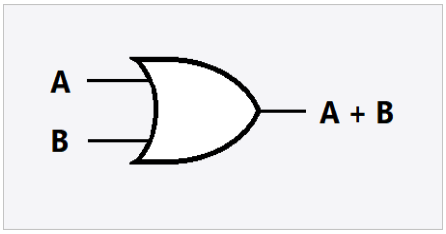
AND Gate



Outputs 1 only if **all** inputs are 1. ATM Withdrawal: An ATM dispenses cash only when a card is inserted AND a correct PIN is entered.

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

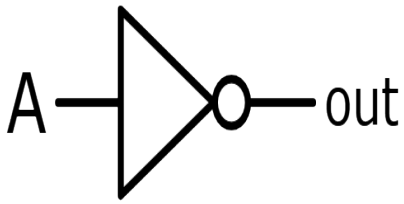
OR Gate



Outputs 1 if **at least one** input is 1. Lighting Systems: Lights can be turned on using a wall switch or a remote control.

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

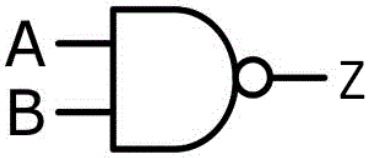
NOT Gate



Produces the **opposite** of the input (inverts it). Temperature Control: A NOT gate can activate a heating or cooling system when the temperature exceeds a set limit.

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

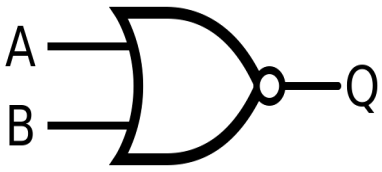
NAND Gate



Outputs 0 only when **all** inputs are 1 (inverse of AND). Digital alarm clock: A NAND gate can be used to silence the alarm when both the "stop" button and the "snooze" button are pressed.

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

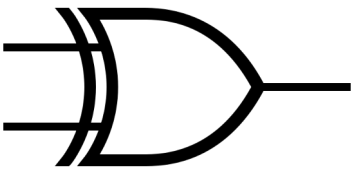
NOR Gate



Outputs 1 only when **all** inputs are 0 (inverse of OR). Traffic lights: A NOR gate can be used to control traffic lights, where the light remains green (output 1) only when neither the "pedestrian crossing" button nor the "traffic sensor" is activated.

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

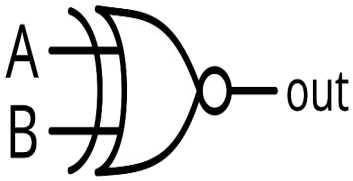
XOR Gate



Outputs 1 only if **exactly one** input is 1. Game logic: XOR gates can be used in game development to implement logic rules, such as "either A or B, but not both".

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). Error detection: XNOR gates can be used to detect errors in digital data transmission by comparing the transmitted and received data.

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