

Objective

- The particles emitted from a hot cathode surface are:

(A) Protons (B) Electrons (C) Negative Ions (D) Positive Ions
- The process by which electrons are emitted by a hot metal surface is known:

(A) Thermionic Emission (B) Conduction (C) Evaporation (D) Boiling
- In tungsten filament the potential given to produce the Beam of Electron by thermionic Emission is:

(A) 6V (B) 9V (C) 8V (D) 7V
- Cathode rays have a charge:

(A) + ve and - ve (B) Neutral (C) Negative (D) Positive
- The biggest achievement of electronics is:

(A) Mobile phone (B) Transistor (C) Calculator (D) Computer
- The cathode ray oscilloscope consists of main parts:

(A) 5 (B) 4 (C) 3 (D) 2
- In CRO the potential of grid is:

(A) Neutral (B) Zero (C) Positive (D) Negative
- The screen of a cathode ray tube consists of a material called:

(A) Phosphorus (B) Glass (C) Iron (D) Zinc
- The logical operation performed by this gate is:

(A) NOR (B) NAND (C) AND (D) OR
- The deflecting plate is a component of:

(A) C.R.O (B) Fluorescent Tube (C) Computer (D) Radio
- George Boole invented:

(A) Geometry (B) Boolean Algebra (C) Mean Algebra (D) Arithmetic
- If $X = A + B$ then $X = 0$ when:

(A) $A = 0, B = 0$ (B) $A = 0, B = 1$ (C) $A = 1, B = 0$ (D) $A = 1, B = 1$
- If $X = A.B$, then $x = 1$ when:

(A) $A = 1, B = 0$ (B) $A = 1, B = 1$ (C) $A = 0, B = 1$ (D) $A = 0, B = 0$
- The output of OR gate will be zero (0) when:

(A) $A = 0, B = 0$ (B) $A = 1, B = 0$ (C) $A = 0, B = 1$ (D) $A = 1, B = 1$
- The equation of Not operation is:

(A) $X = A - B$ (B) $X = A + B$ (C) $X = A.B$ (D) $X = \bar{A}$
- Number of input terminals in NOT gate is:

(A) 2 (B) 1 (C) 3 (D) 4
- The output of two NOR gates is 1 when:

(A) $A = 1, B = 0$ (B) $A = 1, B = 1$ (C) $A = 0, B = 1$ (D) $A = 0, B = 0$

18. Number of input terminals in NOT gate is:

- (A) Non-Inversion (B) Inversion (C) Both A & B (D) None of these

19. Which logical operation is performed by this gate?

- (A) OR (B) NOR (C) AND (D) NAND

20. The output of NAND-gate is "0" when:

- (A) $A = 1, B = 1$ (B) $A = 1, B = 0$ (C) $A = 0, B = 0$ (D) $A = 0, B = 1$

21. AND gate can be formed by using two gates:

- (A) NAND gates (B) OR gates (C) NOT gates (D) NOR gates

22. The output of NOR-gate will "1" if:

- (A) $A = 1, B = 0$ (B) $A = 1, B = 1$ (C) $A = 0, B = 1$ (D) $A = 0, B = 0$

23. If $\overline{A + B} = X$. Then $X = 1$ when:

- (A) $A = 1, B = 0$ (B) $A = 0, B = 0$ (C) $A = 1, B = 1$ (D) $A = 0, B = 1$

Chapter : 16

Basic Electronics



Subjective

Q1: **Define electronics.**

Ans: **Electronic:**

Electronic is that branch of applied physics which deals with the control of motion of electrons using different devices. Electronic devices being more effective and reliable have revolutionized the field of telecommunication and information technology.

Q2: **What is meant by Thermionic Emission?**

Ans: **Thermionic Emission:**

The process of emission of electrons from the hot metal surface is called thermionic emission.

Q3: **Write the name of the factors increasing thermionic emission. Or Name two factors which can enhance thermionic emission.**

Ans: Thermionic emission depends upon the following factors.

- ❖ Temperature
- ❖ Voltage
- ❖ Nature of metal

Thermionic emission increases with the increase in temperature and voltage.

Q4: **Shortly explain the deflection of electrons by magnetic field.**

Ans: When we apply magnetic field at right angle to the beam of electron by using a horseshoe magnet we observe that the spot of the electron beam on the screen is deflected from the original position. If the change the direction of magnetic field the direction of deflection of electrons will also change.

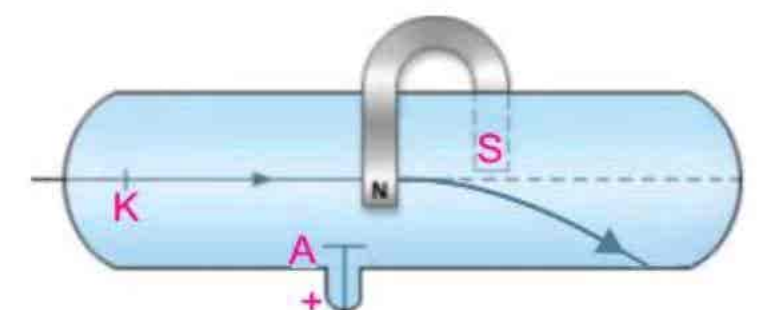


Fig. Deflection of cathode rays by a magnetic field

Q5: **What does C.R.O stands for?**

Ans: C.R.O stands for CATHODE RAY OSCILLOSCOPE.

C.R.O:

The cathode-ray oscilloscope is an instrument which is used to display the magnitudes of changing electric currents or potentials.

Q6: **What is meant by Cathode Ray Oscilloscope?**

Ans: Cathode-ray oscilloscope is an instrument which is used to display the magnitudes of changing electric currents or potentials in form of graphs.

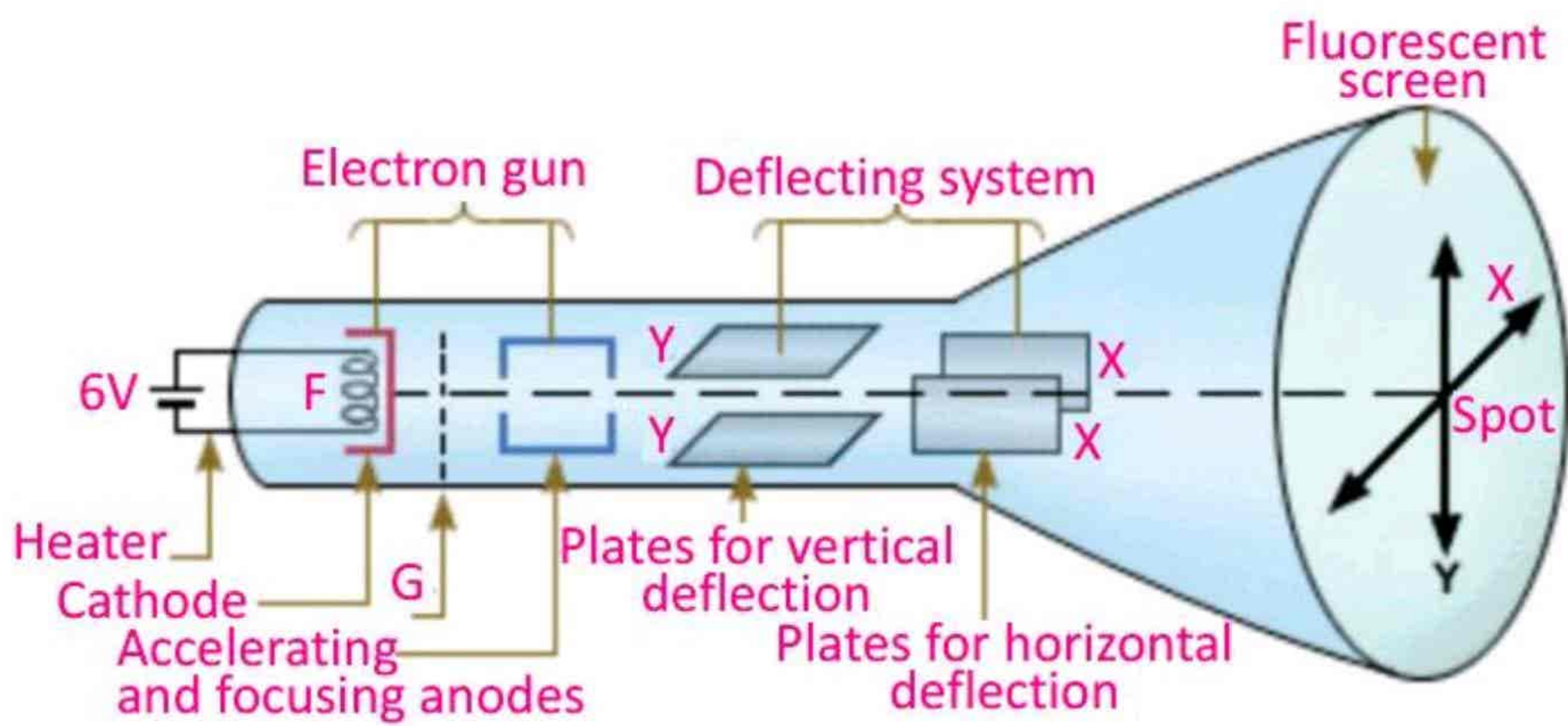


Fig. Cathode-Ray Oscilloscope

Do you know?

Cathode Rays

The beam of electrons was called a cathode ray, because the electron had not yet been discovered. The old terminology survives in electronic engineering where a cathode-ray tube is any tube constructed along Thomson's lines whether in a computer monitor, a television, or an oscilloscope.

Q7: **For which purpose electron gun is used in oscilloscope?**

Ans: Electron gun in oscilloscope is used to produce a fine beam of electrons.

Q8: **Write two part of CRO. Or Write different part of cathode ray oscilloscope.**

Ans: The cathode-ray oscilloscope (C.R.O) consists of the following components:

- ❖ The fluorescent screen.
- ❖ The deflecting plates.
- ❖ The electron gun (with control grid).

Q9: **Describe two parts of Oscilloscope.**

Ans: Parts of Oscilloscope are following:

- ❖ Fluorescent Screen
- ❖ Deflecting plates

Deflecting Plates:

In oscilloscope two pair of electric plates is used to deflect the electron beam to the desired axis either along x-axis or along y-axis. These pairs of electric plates are called deflecting plates where perpendicular plates deflecting along x-axis.

Fluorescent Screen:

The screen of a cathode-ray tube consists of a thin layer of phosphor, which is a material that gives light as a result of bombardment by fast moving electrons.

Q10: **How electron gun works in cathode ray oscilloscope? Explain. OR What is meant by electron gun?**

Ans: Electron gun working in cathode ray oscilloscope:

- ❖ The electron gun consists of an electron source which is an electrically heated cathode that ejects electrons.
- ❖ Electron gun also has an electrode called grid G for controlling the flow of electrons in the beam.
- ❖ The grid is connected to a negative potential.
- ❖ The more negative the potential the more electrons will be repelled from the grid and hence fewer electrons will reach the anode and the screen.
- ❖ The number of electrons reaching the screen determines the brightness.
- ❖ The anode is connected to positive potential and hence is used to accelerate the electrons.
- ❖ The electrons are focused into a fine beam as they pass through the anode.

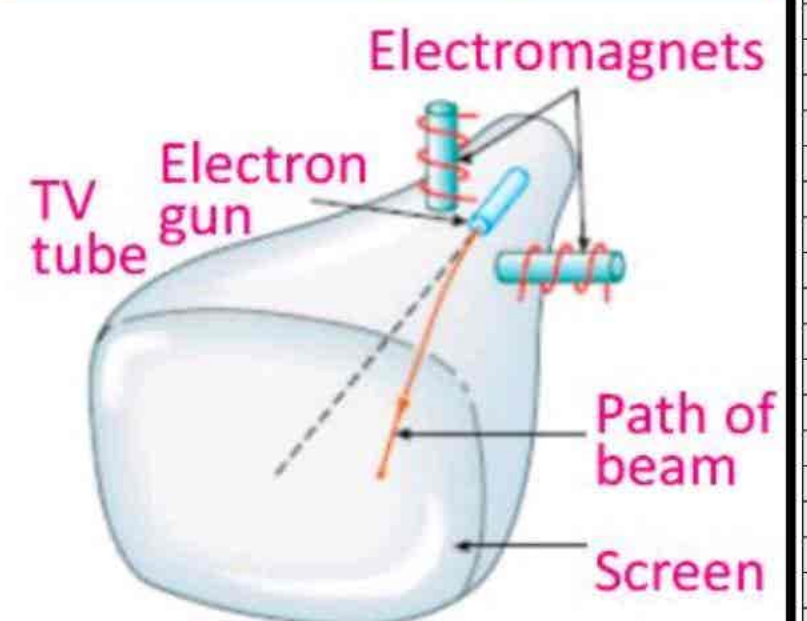
Q11: **Write down the uses of cathode ray oscilloscope.**

Ans: Cathode ray oscilloscope is used in following:

- ❖ To find the depth of sea beds (Echo-sounding).
- ❖ The CRO is also used to display heart beats.
- ❖ The CRO is used in many fields of science.
- ❖ Displaying waveforms
- ❖ Measuring voltages
- ❖ Range finding (as in radar).

Q12: **What do you mean by fluorescent screen?**

Do you know?



Electromagnets are used to deflect electrons to desired positions on the screen of a television tube.

Ans: The screen of a cathode ray oscilloscope consists of a thin layer of phosphorus, which is a material that gives light as a result of bombardment by fast moving electrons. This screen appears as a circular or rectangular window usually with a centimeter graph superimposed on it.

For example:

The picture tube in our TV set and the display terminal of most computers.

Q13: **How the filament is heated in an oscilloscope and why it is heated?**

Ans: The filament is connected to a 6 volt external battery. When it is heated, a large number of electrons are free to move. The more negative this potential, the more electrons will be repelled from the grid and hence fewer electrons will be reach the anode and the screen.

Q14: **What is meant by Analogue Quantities? OR**

Write names of any two Analogue Quantities.

Ans: The quantities whose values vary continuously or remain constant are known as analogue quantities.

Names of any analogue quantities:

- ❖ Distance
- ❖ Time
- ❖ Pressure
- ❖ Temperature of air

Q15: **Define Analogue Electronics.**

Ans: The branch of electronics consisting of circuits which process analogue quantities.

Q16: **What is difference between analog quantities and analogue electronics?**

Ans: The difference between analog quantities and analogue electrons is:

Analogue Quantities	Analogue electronics
❖ The quantities whose values vary continuously or remain constant are known as analogue quantities.	❖ The branch of electronics consisting of circuits which process analogue quantities is called analogue electronics.

Q17: **Define digital quantities and give examples.**

Ans: **Digital quantities:**

The quantities whose values vary in non-continuous manner are called digital Quantities.

Example:

The use of digital electronics was limited to computer only but now days its application is very wide spread i.e. Modern telephone system, radar system, naval and other system of military importance use of digital quantities.

Q18: **What is relation between Digital Quantities and Digital Electronics?**

Ans: **Digital quantities:**

The quantities whose values vary in non-continuous manner are called digital quantities.

Digital Electronics:

The branch of electronics which deals with digital quantities is called digital electronics.

Q19: **Describe the uses of Digital Electronics.**

Ans: Digital Electronics are used in following terms:

Modern telephone system, radar system, naval and other systems of military importance, devices to control the operation of industrial machines, medical equipment and many household appliances are using digital technology.

Q20: **Differentiate between Analogue Electronics and Digital Electronics.**

Ans: The difference between Analogue Electronics and Digital Electronics is:

Analogue Electronics	Digital Electronics
❖ The branch of electronics consisting of circuits which process analogue quantities called analogue electronics.	❖ The quantities whose values vary continuously or remain constant are known as analogue quantities.

Q21: Define digital electronics. OR What is meant by electronics?

Ans: Digital electronics:

The branch of electronics which deals with digital quantities is called digital electronics. Digital electronics use only two digits 0 (zero) and 1 (one) and whole data is provided in binary form.

Q22: What is meant by Logic Operation?

Ans: Logic Operation:

Different operations of Boolean variables are called logic operations.

- ❖ AND-Operation
- ❖ OR-Operation
- ❖ NOT-Operation

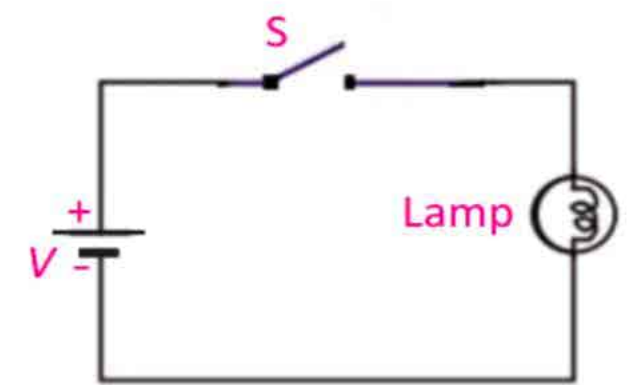


Fig.

Q23: What is meant by binary variables?

Ans: Binary variables:

Such things which can only two possible states are known as binary variables. The states of binary variable are usually represented by the digits 0 and 1. Here 0 (zero) means off or False and 1 (one) means on or True.

Table 16.1	
S	Lamp
Open	OFF
Closed	ON

Q24: What is meant by Logic States?

Ans: Logic States:

The states of Boolean variables are called logic states. These are 0's or 1's. The condition is called logic states.

Q25: What is meant by Boolean algebra? OR How it is represented?

Ans: Boolean algebra:

The algebra which is used to describe the logic operations by means of symbols (A, B, C.....) is called Boolean algebra. It is represented by using Boolean variables i.e. 1's or 0's.



Q26: Write the names of basic operation of digital electronics.

Ans: There are three basic operations of digital electronics.

- ❖ AND operations
- ❖ OR operations
- ❖ NOT operations

Q27: What are the three Universal Logic Gates?

Ans: The universal logic gates are:

- ❖ AND gate
- ❖ OR gate
- ❖ NOT G gate

Q28: Define truth table.

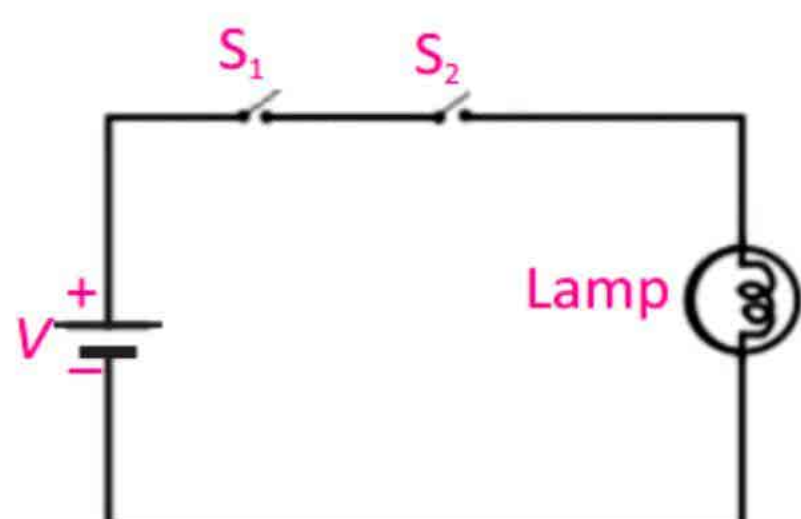
Ans: Set of input and output in binary form is called truth table.

Q29: What is meant by AND operation? Draw the circuit diagram of AND gate. Make the symbol diagram and Truth Table of AND gate.

Ans: Such a logic operation whose value is 1 only when it's all input are at 1 is called AND operation.

The circuit which implements the AND operation is known as AND gate.

Circuit diagram of AND gate:

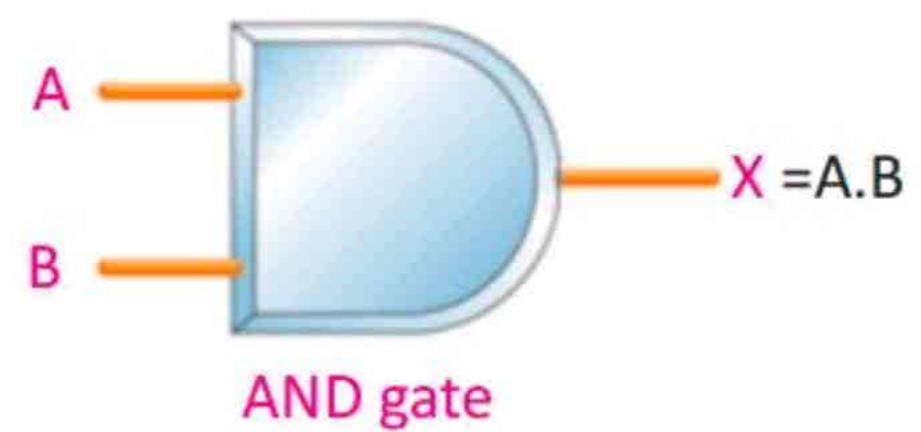


Simple table of AND gate:

Table		
S ₁	S ₂	Lamp
Open	Open	OFF
Open	Closed	OFF
Closed	Open	OFF
Closed	Closed	ON

Truth Table of AND gate.

Table		
A	B	X = A.B
0	0	0
0	1	0
1	0	0
1	1	1

Symbol of AND gate:

Symbol for AND operation is dot (.).

Boolean expression or Formula:

- ❖ Its Boolean expression is, $X = A.B$
- ❖ And is read as "X equals A AND B"

Q30: What is meant by OR operation? Draw the circuit diagram of OR gate. Make the symbol diagram and Truth Table of OR gate.

Ans: OR Gate:

The electronic circuit which implements the OR operation is known as OR gate.

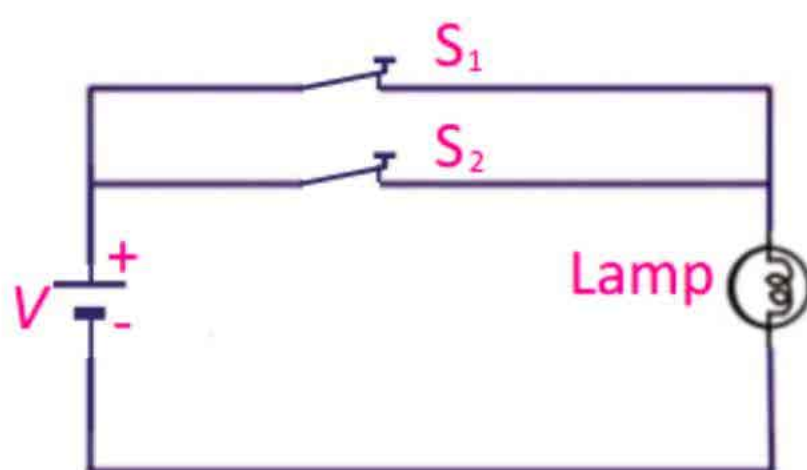
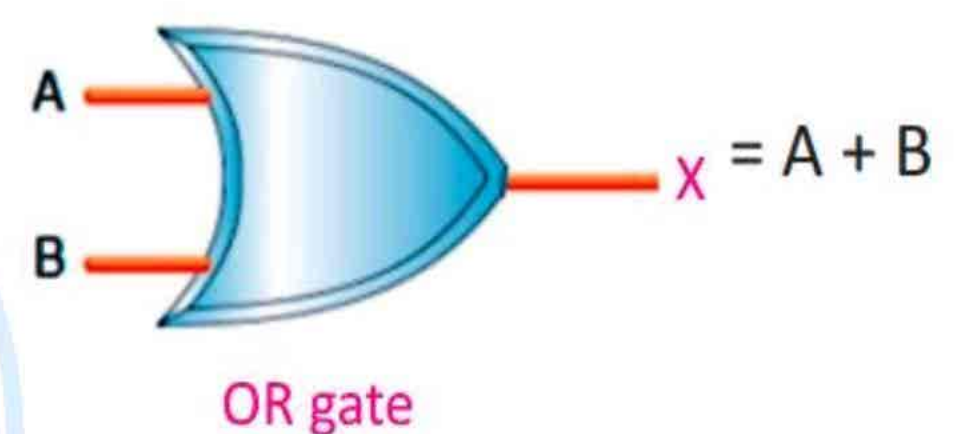
Circuit diagram of OR gate:**Simple table of OR gate:**

Table		
S ₁	S ₂	Lamp
Open	Open	OFF
Open	Closed	ON
Closed	Open	ON
Closed	Closed	ON

Truth Table of OR gate.

Table		
A	B	X = A+B
0	0	0
0	1	1
1	0	1
1	1	1

Symbol of OR gate:

OR operation is represented by the symbol of plus (+).

Boolean expression or Formula:

- ❖ Its Boolean expression is, $X = A + B$
- ❖ And is read as "X equals A OR B".

Q31: What is meant by NOT operation? Draw the circuit diagram of NOT gate. Make the symbol diagram and Truth Table of NOT gate.

Ans: NOT Gate:

The electronic circuit, which implements NOT operation, is known as NOT gate.

NOT gate performs logical complementation. NOT gate performs the basic logical function called inversion or complementation. NOT gate is also called inverter.

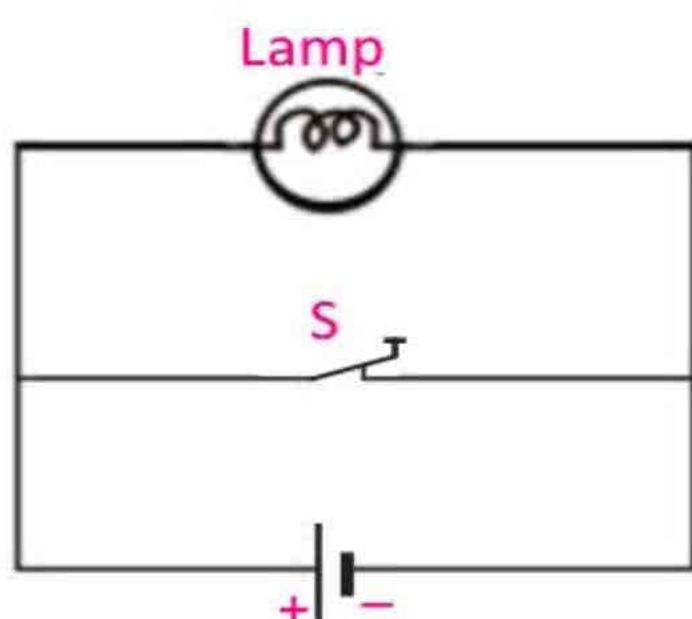
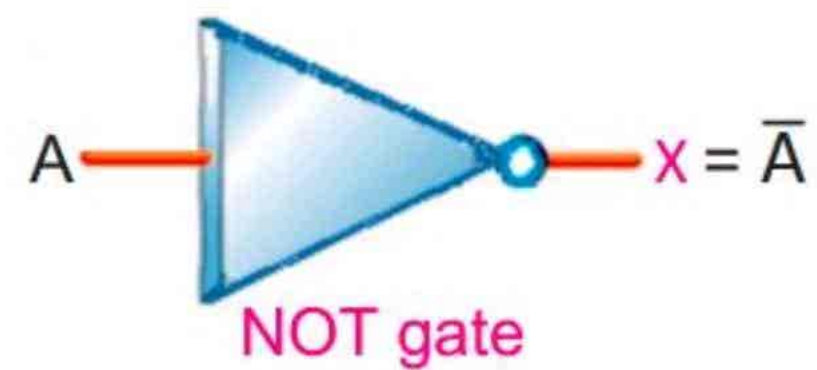
Circuit diagram of NOT gate:**Simple table of NOT gate:**

Table	
S	Lamp
Open	ON
Closed	OFF

Truth Table of NOT gate.

Table	
A	$X = \bar{A}$
0	1
1	0

Symbol of NOT gate:

NOT operation is represented by a line or bar over the symbol i.e.

Boolean expression or Formula:

- ❖ Its Boolean expression is, $X = \bar{A}$
- ❖ And is read as "X equals A NOT".



Q32: What is meant by NAND operation? Draw the circuit diagram of NAND gate. Make the symbol diagram and Truth Table of NAND gate.

Ans: NAND Gate:

NAND gate is obtained by coupling NOT gate with the output terminal of the AND gate. The electronic circuit which implements NAND operation is known as NAND gate.

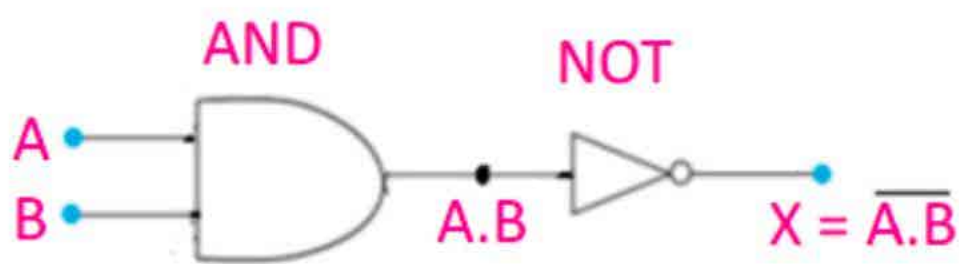
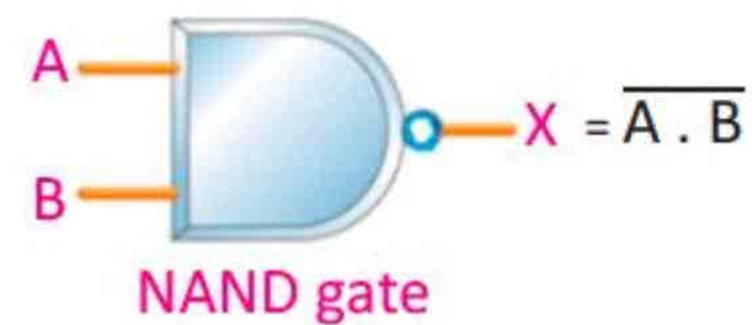
Circuit diagram of NAND gate:**Symbol of NAND gate:****Truth Table of NAND gate.**

Table		
A	B	$X = \overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0

The NOT gate inverts the output of the AND gate. The output of the NAND equals $\overline{A \cdot B}$

Boolean expression or Formula:

- ❖ Its Boolean expression is, $X = \overline{A \cdot B}$
- ❖ And is read as X equals A AND B NOT.

Q33: What is meant by NOR operation? Draw the circuit diagram of NOR gate. Make the symbol diagram and Truth Table of NOR gate.

Ans: NOR Gate:

The NOR operation is simply an OR operation followed by a NOT operation. The NOR gate is obtained by coupling the output of the OR gate with the NOT gate

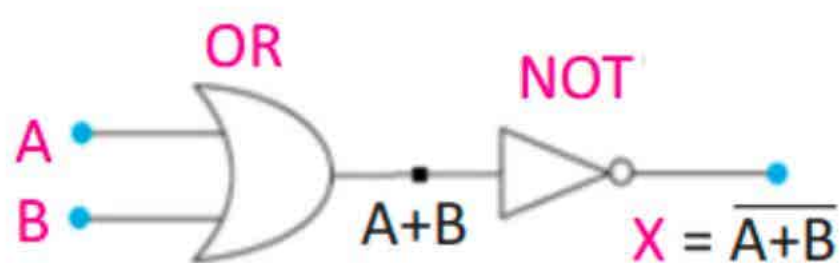
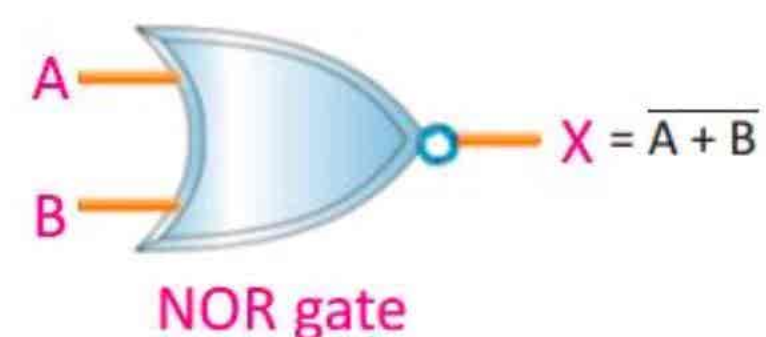
Circuit diagram of NOR gate:**Symbol of NOR gate:****Truth Table of NOR gate.**

Table		
A	B	$X = \overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0

Thus, for the same combination of inputs, the output of a NOR gate will be opposite to that of an OR gate.

Boolean expression or Formula:

- ❖ Its Boolean expression is, $X = \overline{A + B}$
- ❖ And is read as X equals A OR B NOT

For your information

$$X = \overline{\overline{A}} = A$$

$$X = \overline{\overline{A + B}} = A + B$$

$$X = \overline{\overline{A \cdot B}} = A \cdot B$$

Here double line indicates double NOT operation.

Q34: Write the use of logic gates.

Ans: We can use logic gate in house safety Alarm.

House safety Alarm:

Burglar alarm can be made using NAND gate an LDR, a push-button switch S and an alarm connect LDR between NAND gate input B and the positive terminal of the battery. The LDR will cause a high level input (1) at B when in light because of its low resistance.

The LDR will cause a low level input (0) at B when light is interrupted and causes high resistance in LDR. A low level signal is also caused at A when burglar steps on switch S so this burglar alarm sounds when either burglar interrupts light falling on LDR or steps on switch S.

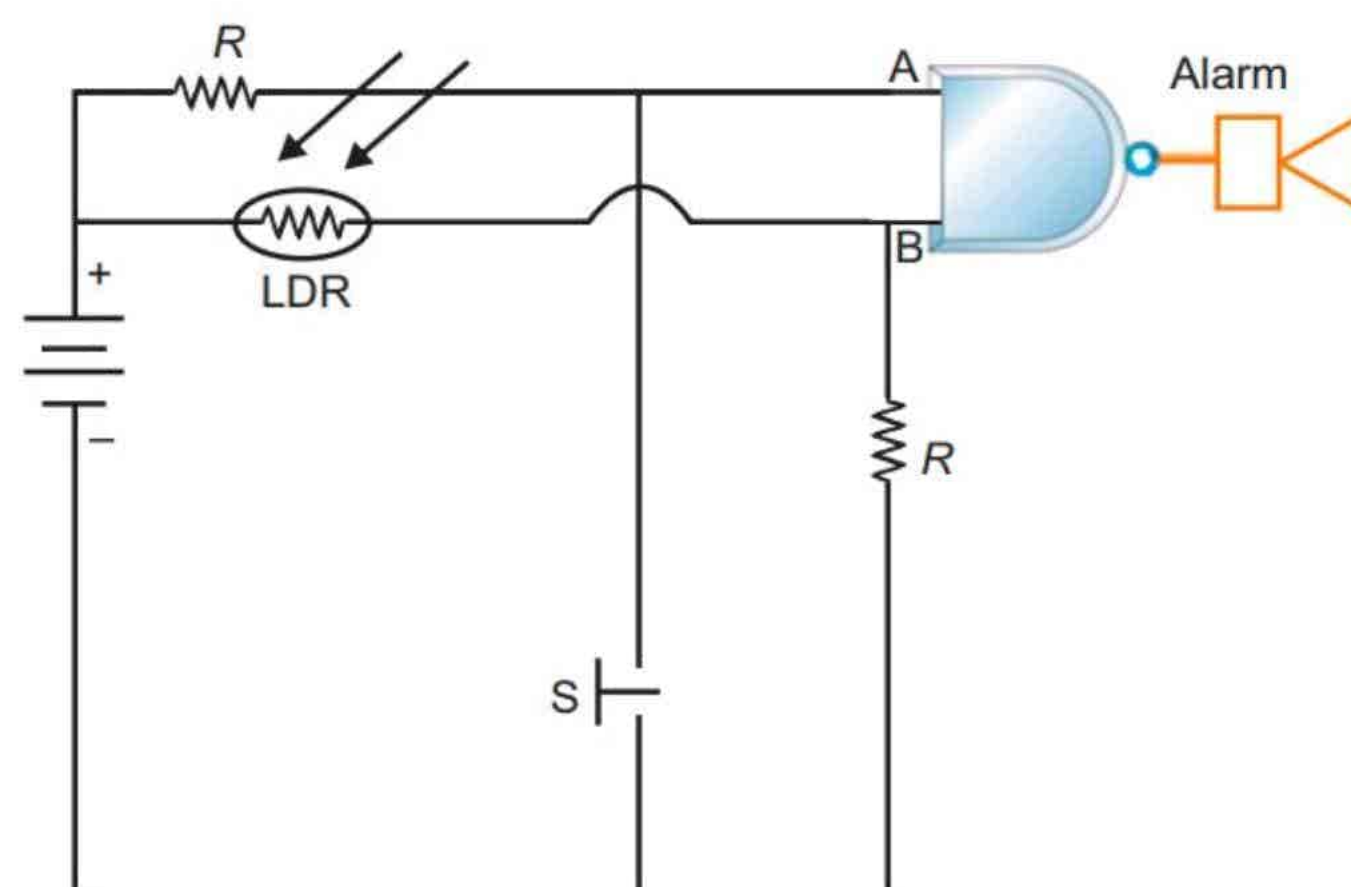


Fig. Burglar alarm schematic circuit

Q34: How does a LDR work?

Ans: LDR stands for light depending resistors. It acts as a switch that is closed when illuminated by light and open in the dark.

Imp. Long Questions

- Q.1:** Explain the deflection of electrons by electric and magnetic field.
- Q.2:** What is Cathode Ray Oscilloscope? Explain different parts of oscilloscope. Write down its uses.
- Q.3:** What are three universal logic gates? Give their symbols, logical expression and truth table. Also explain with the help of circuit diagram.
- Q.4:** Explain that how logic gates are used in House Safety Alarm?