

Electronics

Part - C

Answer to Question No: 01

The Laws of Resistance :

There are basically three laws of resistance. These are as follows -

(i) The law of Length :

If the temperature and element of the conductor are constant, the resistance of the conductor is proportional to its length.

Mathematically, $R \propto L$; where
[if T and element are constant].
R = resistance
L = length

(ii) The law of Area:

If the temperature and length of the conductor are both constant, the resistance of the conductor is ~~pr~~ inversely proportional to its area of the cross section of the conductor.

Mathematically,


$$R \propto \frac{1}{A}$$

where
 $A =$ area of the cross section of the conductor.

(ii) the law of Element

If the temperature of the two conductors is constant, and the room temperature is constant, and the area of the cross sections and the lengths of the two conductors are all same or equal; the resistance will still differ according to the element of the conductors.

These are the laws of resistance.

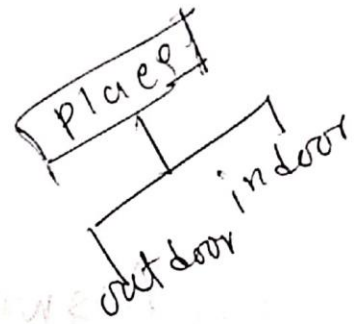
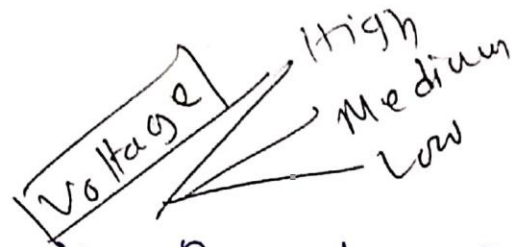
Answer to Question - 02

Circuit Breaker :

A circuit breaker is an electronic device that does not detect overflow of current in a circuit but resist and stop the overload of electrical current in a circuit is called an circuit breaker.

- A circuit breaker takes a relay to start its work in a circuit.
- A circuit breaker does not need to be replaced every time there is a short circuit.

Types of Circuit Breakers:



There are different types of circuit breakers. The Mains are —

(i) GFCI — Ground Fault Circuit Interruptor.

works to channel the extra electricity of a circuit into the ground.

(ii) Fuse — a special kind of circuit breaker that burns itself if there is an overload of electricity or a short circuit.

Answer to Question No: 03

Parallel Resistor: When all the

resistors in an electric circuit are connected with a single source of electro-motive force (emf) or battery, it is called a parallel resistor in a circuit. The equivalent



$$R_p = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

Fig # a parallel resistor in a closed circuit.

In the diagram R_1 , R_2 and R_3 have 1 point connected in point A and their other ends are connected to point B.

Series Resistor:

When all the resistors of a circuit are sequentially connected and the electric current is divided across the whole circuit, it is called a series resistor circuit.

In the diagram, we can see that R_1 , R_2 and R_3 are serially connected in the circuit.

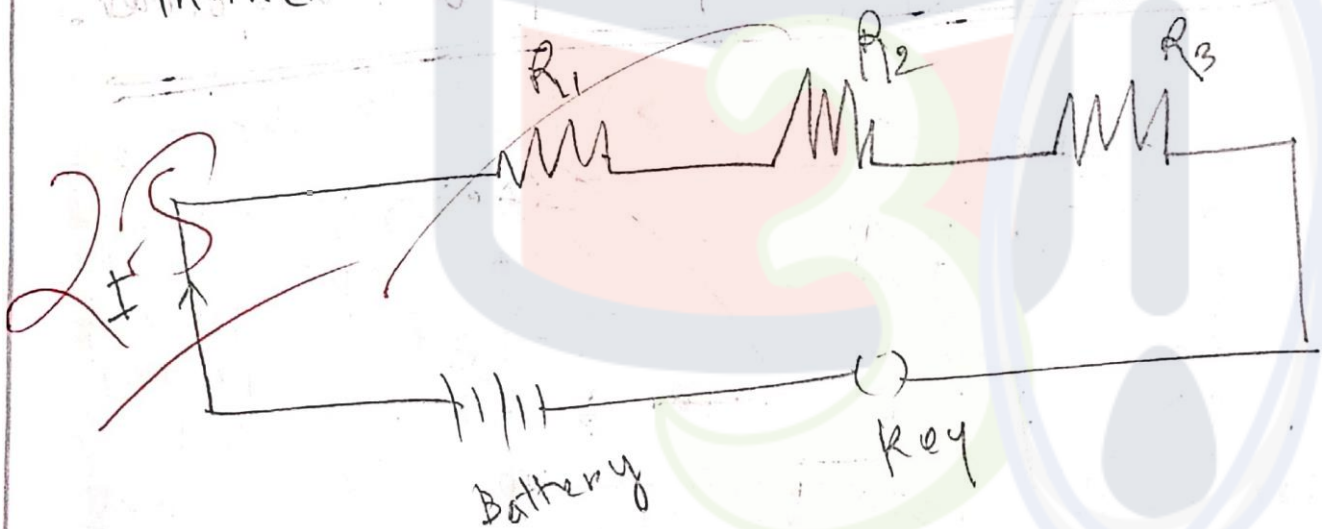


Fig # A Series resistor in a closed circuit.

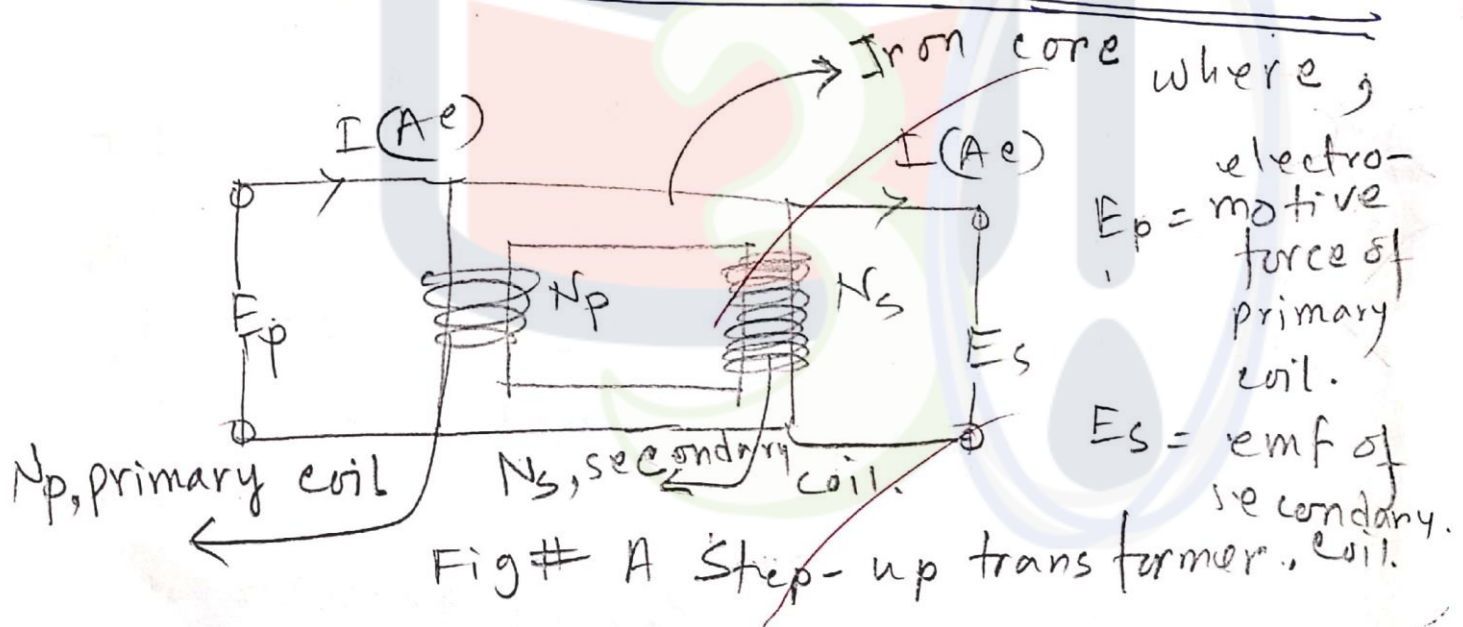
The Equivalent Resistance, $R_s = R_1 + R_2 + R_3$

Answer to Question No: 05

Transformer :

An electronic device that transforms low voltage to high level voltage and high level voltage to low level voltage in a power distribution system is called a transformer.

The working Principal of a Transformer:



In the diagram, if we input an amount of AC current, I in the primary coil N_p , we get an electro-motive force, E_s

for the property of mutual-induction of the two coil.

The ideal equation of a transformer

is
$$\frac{E_p}{E_s} = \frac{N_p}{N_s} \quad \text{--- (1)}$$

In step-up transformer,

$E_s > E_p$ if $N_s > N_p$

In step-down transformer,

$E_s < E_p$ as $N_s < N_p$.

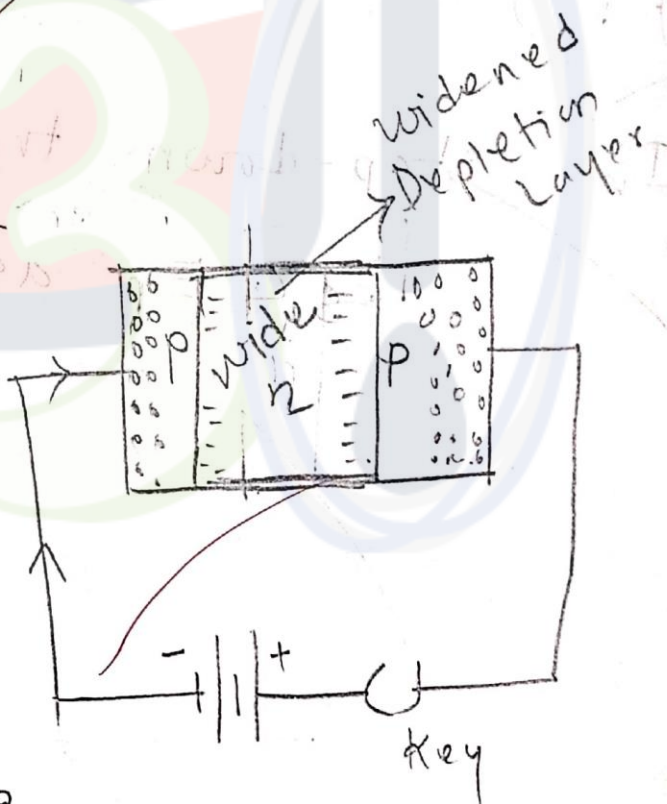
Answer to Question No: 06

Biasing :

To provide an input of voltage or a kind of electro-motive-force (emf) or a pressure in a circuit to keep the electron flowing or to keep the current flowing is called 'biasing' in a circuit.

Forward Bias :

When the negative side of the source of emf of a circuit is connected with the positive side of p-n-p diode, then attraction force is the opposite



Fig# Forward biasing in a circuit -

molecules ~~causes~~ causes a wide spread between the two p-type semi-conductors.

Reverse Bias

In reverse bias, the two same ionised

sides such as the negative

side of

a battery

is connected

with n-p-n

diode's n-type

side. The repulsion

force between the

electrons and electrons of the battery

causes the produce a narrow band of

space that is called narrow depletion

layer. This called the reverse

bias in a circuit.

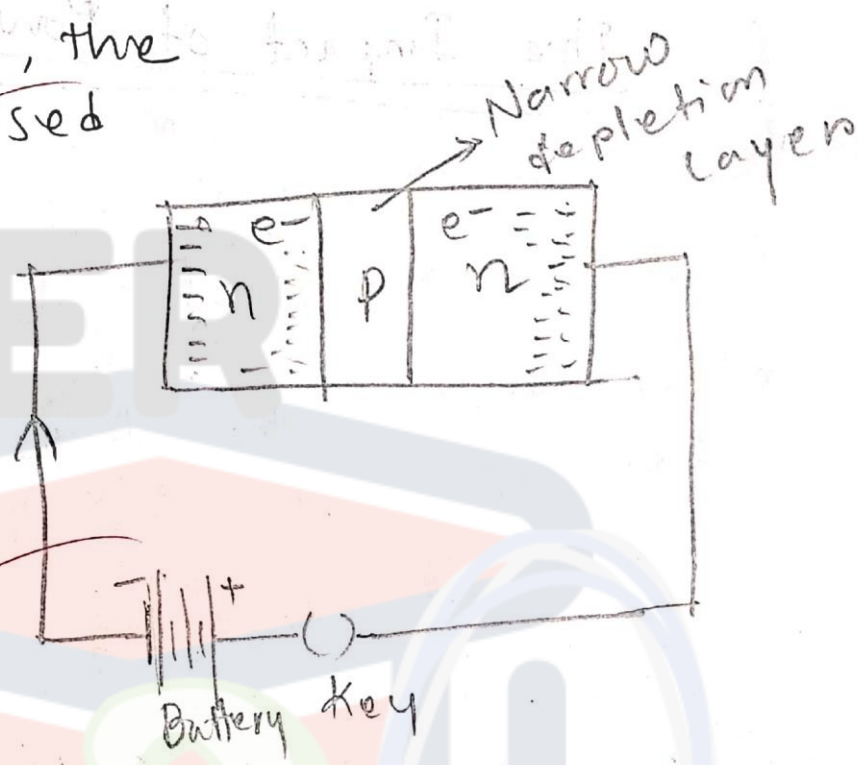


Fig # Reverse biasing in a circuit.

Answer to Question No: 08

The Impact of Power Factor :



Where,
KW = electricity
KVA = Voltage

$$\text{Power Factor} = \cos \theta = \frac{KW}{KVA}$$

According to V.K. Mehta's book

"Power System" —

"Power factor is the cosine of the angle between current and voltage in an electric AC circuit."

For an AC circuit,

$$P = VI \cos \theta$$

Where, P = power of the circuit ;

V = Voltage and I = current.

The impacts of Power Factor in an AC circuit:

The impacts are listed as below—

1) As the power of the circuit is dependent to its current and resistance, $P = I^2 R$; to keep the power unchanged, for power factor

resistance, R will increase and thus, I will decrease. For this,

→ fans will be moving slow with the same amount of current (I).

→ lights will dim because of the low level electricity or power (P).

2) other ~~fact~~ impacts include causing actual electricity and apparent electricity differ more and more with high electric bill.

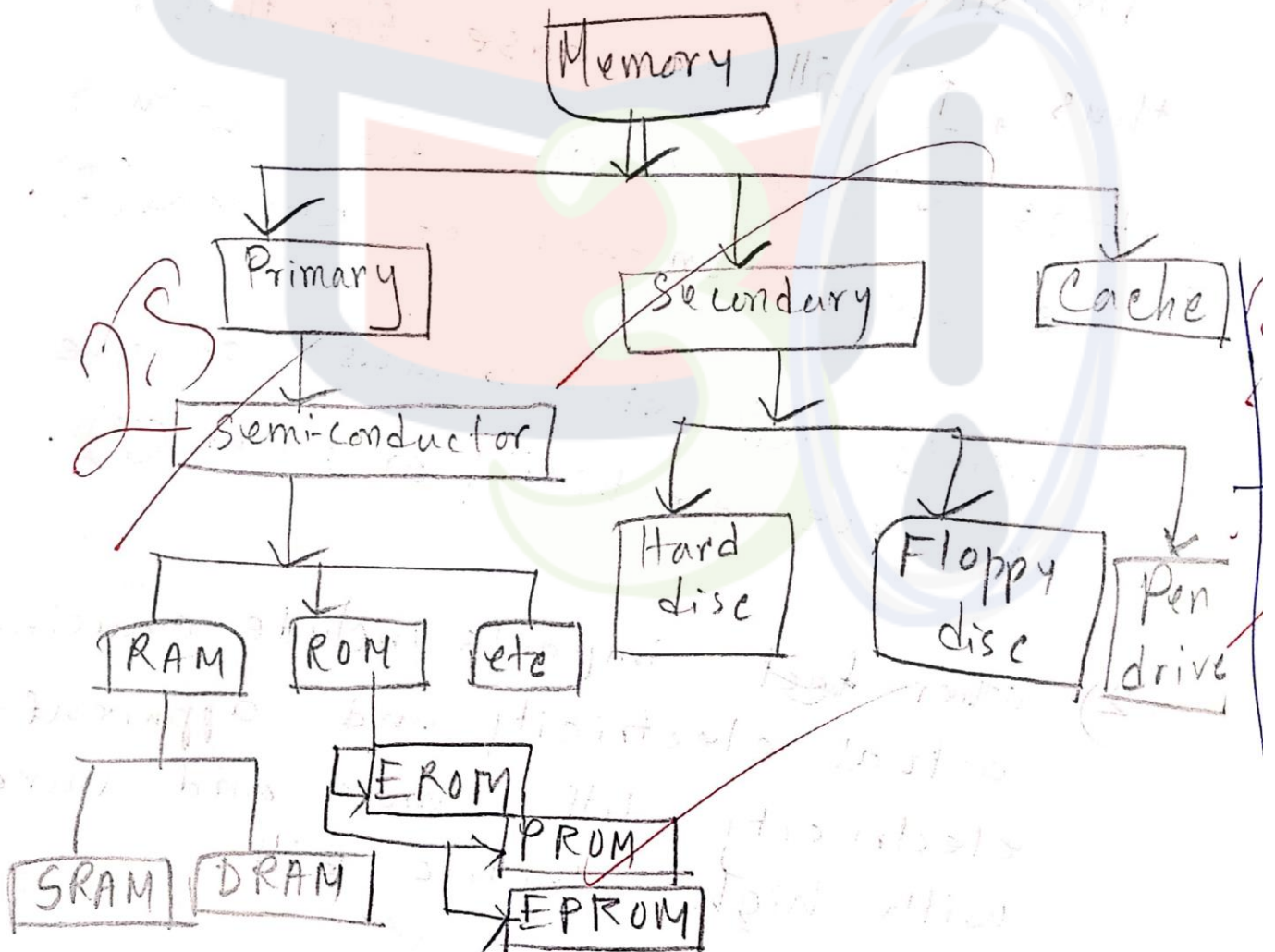
Part - B

Computer. and Information Technology

(Q.1)

The classification of Computer

Memory :



Question - 02

The Difference between Hard System Software and Application Software :

The differences are —

<u>Topic</u>	<u>System Software</u>	<u>Application software</u>
01) Definition	A system software is the operating programme of a computer via which the computer programmes run.	An application software is a particular software made for a specific or a set of tasks to perform.
02) Classification	3 types of system softwares are there - (i) System Software; (ii) Support-System software and (iii) Management system software.	Two (2) types of application softwares - (i) general and (ii) application specific.
3) Examples	MS windows, Vista, MS DOS etc.	MS office, MS Access

~~Answer to Question NO: 090~~

~~Flow chart~~

Answer to Question NO: 10

IP Suit

The elaboration of the term 'IP' is 'Internet Protocol'.

Therefore, 'IP suit' refers to the 'Internet Protocol Suit' of a communication system.

'Protocol' means the set rules for communication via computer networks in an internet system like LAN, MAN and WAN -

the names of protocols :

The two main protocols of an IP suit are —

(i) Transportation Protocol

&

(ii) Communication Protocol.

Answer to Question NO: 05

The Errors of Software :

The error while programming the codings of a software like in the set of rules to perform a task is called the error of software.

It is called ~~de~~ "bugging" of a software. Similarly, the removal of computer errors is called "debugging".

The Types of Errors of Software :

There can be basically two types of software errors.

Those are

(i) The error of Syntax :

When there is error in the language of the coding of the software programme like

'TIME' is spelled incorrectly

'ETIM', then it is called the 'syntax' error of software.

(ii) The Error of Logic :

When there is an error in the very 'logic' of the software

codes; it is called a 'logic-error' of the software. For example, if 'yes' is coded as 'No' in the algorithms.

Answer to Question No: - 06

Difference between Hardware and Software %

Topic : Hardware Software

01. Definition : - The physical part of a computer system that can be touched is called the hardware of a computer system. - The set of programmes to run to perform in the computer is called software.

02. Nature : - Tangible and easily repaired by replacement. - Intangible and not easily repaired.

03. Examples : - Mouse ; - input monitor - output CPU - Processing units - Operating softwares MSOS ; - application softwares MS office etc.

Answer to Question No. 07-

DBMS :

The full form of 'DBMS' is called the Database Management System.

The system through which the data or information of a company or organisation is managed is called DBMS.

The Main functions of DBMS :

The main functions of Database Management System are -

(i) to make sure easy access of useful information of the organisation using it;

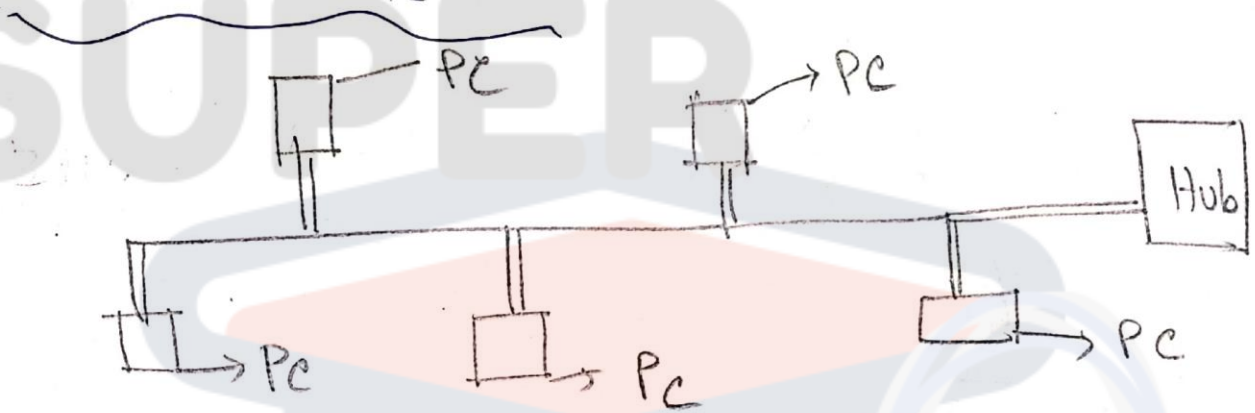
(ii) to ensure security of the stakeholders of the whole DBMS system;

(iii) to manage huge inflow of data.

Answer to Question No: 08

Different Types of Topology :

BUS Topology :



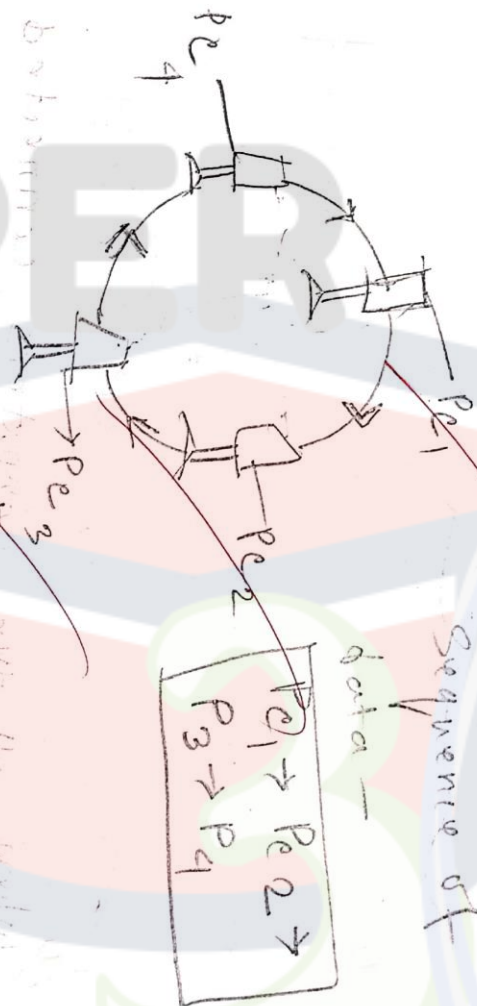
Fig# BUS Topology.

2.5 When all the computers connected in the network are serially arranged like a 'bus', it is called the 'BUS' Topology of a Local Area Network (LAN).

RING Topology :

When all the computers of a LAN

are centrally connected with a 'HUB', and they form a 'ring' - like round shape, it is called the 'RING' Topology of a network.



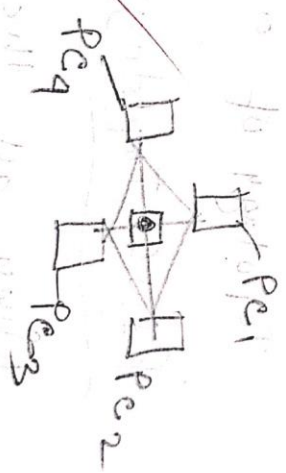
Fig# Ring Topology

STAR Topology

When all the PCs of a LAN are inter-

connected with - each other forming a star-like structure,

it is called a STAR Topology.



Fig# Star Topology

Answer to question No: 09

Benefits of Peer to Peer Network

The benefits of Peer-to-peer Network,

are - a) ensure quick access to

b) ensure security of the

users as passwords are assigned.

Disadvantages of Peer to Peer Network?

The disadvantages of peer to peer

Network are -

a) slow inflow of data as one

peer is dependent on other

peer's response;

b) not many PCs can be connected in this process.

Answer to Question NO : 11

Blog :

The expression of ideas in a few number of letters is called "blogging" and the expressed idea is called a "blog".

The Father of Blogging is :

✓ The father of blogging is —
Evans Williams.

there can be many ways of blogging like posting on a blog site of an individual.
How Blogging is Done :

Today, the very popular site for micro-blogging is called the "Twitter".

the logo:



"A flying bird"

Process of Blogging: via 'Twitter' account
a person has to complete his or her
idea within 140 words and 'post' it as
a tweet.
Answer to question No. 12

The Types of E-commerce:

There are mainly three types of
e-commerce -

① B2B:

The type of e-commerce where

transactions are held between ~~the~~
~~government~~ ^{commercial} bodies or companies
and doing ^A business online.

The transactions may include
wholesale purchase of milk by a

business organisation from another organisation.

(ii) B2E

The type of e-commerce where online trading transactions are held between a business company and an individual customer.

(iii) C2C

The type of e-commerce where two consumers or customers do online transactions like in OLX.com, ibikroy.com, etc.

The other type of e-commerce may be G2G. In this, transactions are held between two country's governments.

Part - A

General Science

Answer to Question NO.:

01

(a) Luminant substance :

The substances that have their own light are called luminant substances.

Examples - different fluorescent particles available in nature, the Sun, the stars in the sky.

Dark / Dim substances :

the substances that cannot radiate light of their own are

called dark particles or substances.

Examples: the planets of the solar system like the Earth; the black particles in the space etc.

(25)

The Four theories of light:

- (i) The particle theory of light by Isaac Newton;
- (ii) the wave - theory of light by Huygens;
- (iii) the quantum theory of light by Max Planck and
- (iv) the electro - magnetic theory

of light by J Maxwell.

The Wave theory of Light :

The wave theory of light promotes the idea that there is an invisible and imaginary medium called "Ether" through which light travels like a wave.

Although, later it was debunked that there is a medium called "ether".

According to this theory, it is stated that light travels in a packet of 'quanta'.

(54)

Diffraction of Light :

The property of light having a small wavelength that allows light to diffuse into seven colors of the electro-magnetic spectrum is called "diffraction of light".

How A Billboard of Advertisement is ~~is~~ Illuminated at Nights :

When the different colors of light radiate from the advert billboard, the small wavelength lights diffract more and the

lights that have larger wavelengths diffract less. Thus, the billboards radiate at nights.

(a)

The Photo-Electric Effect :

When photons of a light are incident on a photo-voltaic or solar cell of ~~that~~ a metal, the speedy electrons are emitted from the photo-voltaic cell.

This is called the photo-electric effect of light or in other words, when light is incident on a metal, electrons are emitted.

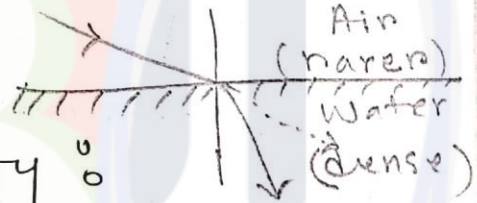
Ans to Question No: 02

(2)

Refraction of Light :

The bending of an incident ray of light towards the perpendicular of the two media of which light travels, from the rarer medium to dense medium is called the refraction of light.

The Range of Audibility :



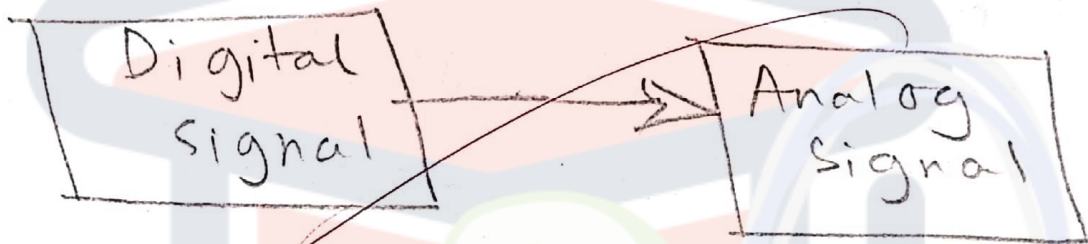
We can hear sounds that have frequency between 20 Hz to 20,000 Hz.

This is the range of audibility of humans. Bats and other animals have ranges beyond 20,000 Hz.

(a)

Modulation

The process through which digital signal is converted into an analog signal is called modulation of signals.



Fig# Modulation process.

Demodulation

The opposite of modulation is called demodulation.



Fig# Demodulation of signal.

The demodulation process.

Ans to Question No. 03

(3)

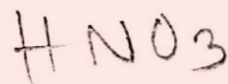
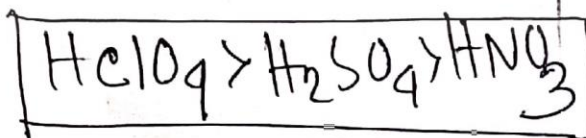
Let, the central oxidation number of

$$N = x,$$

$$Cl = y \text{ and}$$

$$S = z.$$

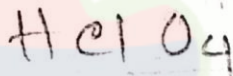
So, the sequence of activity or strength is



$$x = -3(-2) - (1 \times 1)$$

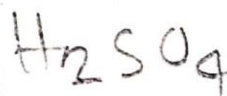
$$= 6 - 1$$

$$= 5$$



$$y = -4(-2) - (1 \times 1)$$

$$= 8 - 1 = 7$$



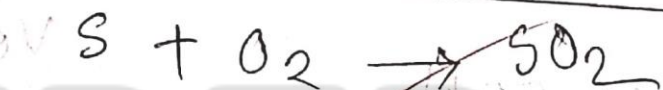
$$z = -4(-2) - (2 \times 1)$$

$$= 8 - 2$$

$$= 6$$

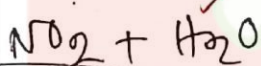
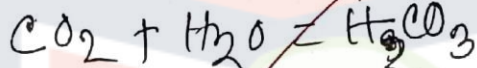
(v)

The Reactions of Acid Rain :



↓
Rain
Water

Add



Acid
rain

(54)

The Uses of weak Acids in Daily life :

~~III~~ as toilet cleaner.

(i) Vinegar - Acetic acid as pickles' solution.

(ii) Citric acid - taken in lemons.
($C_6H_8O_7$)

(iii) Lactic acid - taken in milk.

(iv) Oxalic acid - taken in vegetables.

(COOH)
|
(COOH)

(v) Malic acid - taken via apples / tomatoes.

(a)

The Laws against Acid-Terrorism

The Acid-Prohibition and Control Act of 2002 of our country states in Article 92, 35; 93 and others that the production of

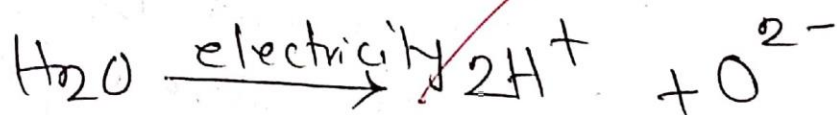
acids; supply and delivery of acids are completely restricted except for some industrial purposes -

Answer to Question No: 04

(8)

Electrolysis:

The conduction of electricity in a solution like water and divide the ~~atom~~ molecules into ions with charge is called the electrolysis.



The Parameters of Water's Purity

(i) BOD - Biological Oxygen Demand of water.
safe if range is between 6-10 mg/L.

(ii) COD - Chemical Oxygen Demand of water.

(iii) TDS - Total dissolved substance of water.
it denotes the amount of substances dissolved in all the earth's water.

प्रकाश व प्रकाश

2) Light:

Light is an electro-magnetic wave that travels through vacuum or any medium as an angular wavelength. Light is itself invisible but can make other substances visible by reflecting upon them. Light is also defined as an energy.

Nature of Light: About the nature of light,

According to the Scientist Broglie, -

2) "light can act as a particle or corpuscular and light can also act as a wave".

The nature of light can be described in different perspectives. Some of the prominent theories of nature of light are:

- (a) The Corpuscular theory of light - 1672

- (b) The Photon theory of light;
 - (c) the wave theory of light and
 - (d) The Quantum theory of light (1900)
- Those are the theories of light and its nature.

Q1 How the light is Produced?

Light is by the energy shifts that the electrons ^{gain} roaming around the particle's n and p axes by heat from the sunlight. When the electrons move to higher energy axes from lower energy axes and gains energy.

Whenever the electrons come back to lower energy axes of the particle, the energy gained has to emit as light. Thus, light is produced.

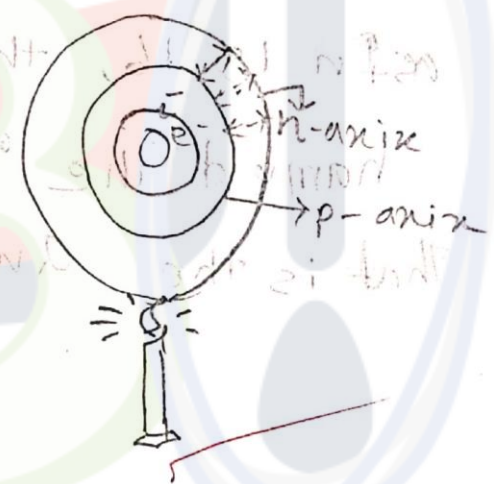


Fig: Light is produced by the energy gained by the electrons of the particle.

① Quantum Theory of Light

According to Max Planck's Quantum theory;

"Light is not a continuous ~~to~~ electro-magnetic wave that travels through transparent media but it travels in small packets of energy called as Quantum".

This theory is also called as 'Photon theory' as in 1916, the scientist ~~Luise~~ Einstein named the 'Quantum' as the 'photon'. That is the Quantum theory of light.

8) The Reflection of Light :

The Reflection of light can be described as the incidence of light rays

on a particular incidence point (i) while travelling through one transparent

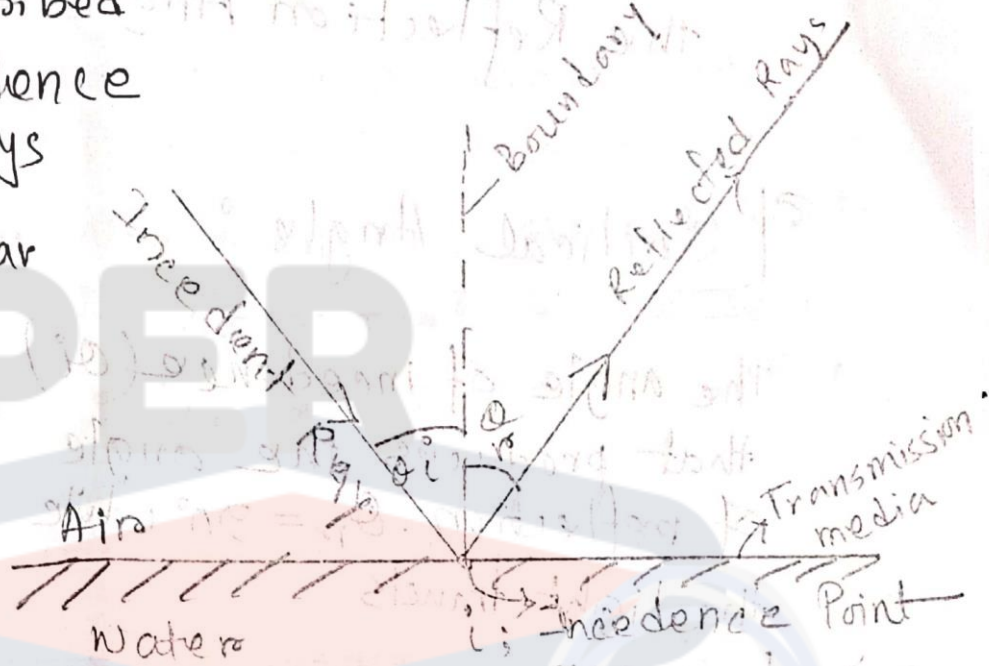


Fig: The Process of the Reflection of Light.

2) medium to another medium and return to the same medium by the equal Incidence angle (θ_i) is ~~and the~~ called the Reflection of Light.

The Formulae of Reflection of Light :

There are two rules of reflection of light.

those are — (i) the incident rays of light, incidence point (i); reflected rays and the transmission

medium are on a same plane.

(ii) the Incidence Angle (θ_i) equals the Reflection Angle (θ_r).

Critical Angle :

The angle of incidence (θ_i) that produces the angle of reflection, $\theta_r = 90^\circ$ while the light travels

from one transparent medium to another is called the Critical Angle of Reflection = θ_c .



The Total Internal Reflection of Light :

From the above picture, we can see the Total Internal Reflection of Light. It can be described

Fig : Critical Angle of Reflection θ_c and the

Total Internal Reflection of Light.

as the ~~incidence~~ incidence of light rays while travelling from a transparent medium such as the air ~~an~~ to a denser medium such as the water on an incident point and change the direction in the denser medium to an angle of 90° ; that is called as the Total Internal Reflection of light.

2) Reasons of the Partition of Bengal

2) Reasons of the Partition of Bengal

The several reasons of the partition of Bengal are →

(i) Administrative Reasons of the British rule: It was reported to be burdensome to govern such a huge population of 7 crore under one governor.

(ii) Political Reasons of the British Rule: Historians have long