ব্যাচ সময়	6 pm
রোল নম্বর	
বিষয়	
পূর্ণমান	৫০/১০০
প্রাপ্ত নম্বর	৫০.৩

উত্তর পত্র

�৪৮ তম বিসিএস লিখিত পরীক্ষা ২ ০ ১ ৮

মেরিনা পারভীন
পরীক্ষার্থীর নাম

Rajshahi
নিজ জেলা

মেরিনা পারভীন
স্বাক্ষর

পরিদর্শকের স্বাক্ষর

১৪.৭.১৮
তারিখ

প্রবেশপত্রে দেওয়া নিয়মাবলী অনুযায়ী রেজিস্ট্রেশন নম্বর, বিষয় কোড নম্বর ও সংশ্লিষ্ট বৃত্তসমূহ সঠিকভাবে পূরণ করতে হবে।

PSC রেজিস্ট্রেশন নম্বর

বিষয় কোড		
⓪	⓪	⓪
①	①	①
②	②	②
③	③	③
④	④	④
⑤	⑤	⑤
⑥	⑥	⑥
⑦	⑦	⑦
⑧	⑧	⑧
⑨	⑨	⑨

"অনুশীলনই সাফল্যের পূর্বগত"

Electronics
Parts - 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, $\boxed{R \propto L}$; where

[if T and element are constant].

R = resista -nce

L = length

(ii) The law of Area :

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

Mathematically,

$\boxed{R \propto \dfrac{1}{A}}$; where

A = area of the cross section of the conduction.

(iii) The law of Element :

If the temperature of the two conductors on 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.

Those 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 a 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 Breaker:
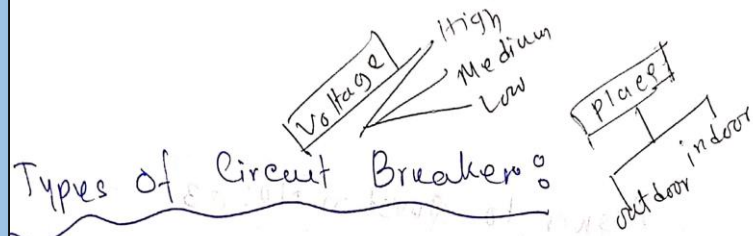
There are different types of circuit breaker. The Mains are:—

(i) GFCI — Ground Fault Circuit Interruptor.

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

2S

(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 resis-tance,

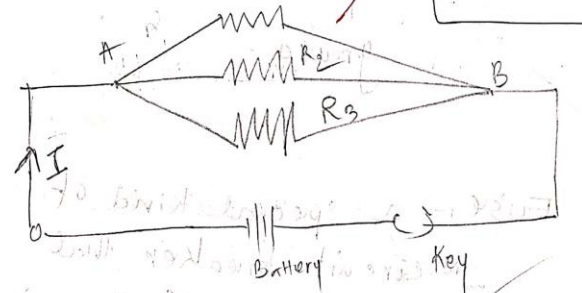$$R_p = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

fig # a parallel resistor in a closed circuit.

In the diagram R_1, R_2 and R_3 have 1 point connected in poin 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.
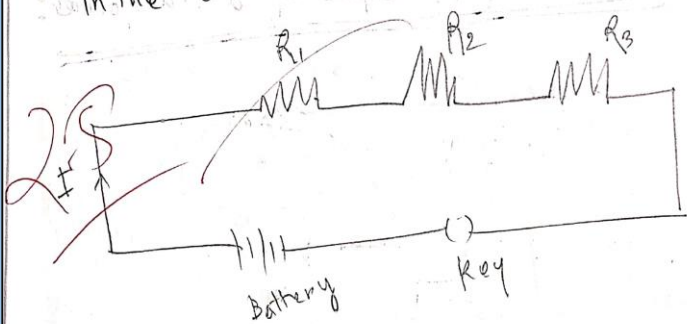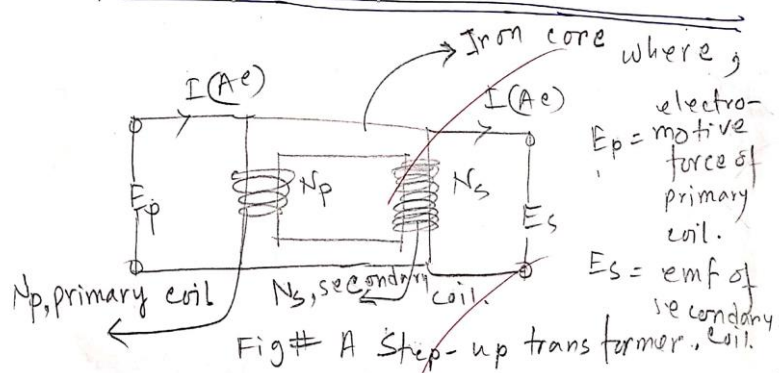

Fig# A series resistor in a closed circuit.

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

Transformer:

An electronic devise 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:

where;
E_p = electro-motive force of primary coil.
E_s = emf of secondary coil.

Fig# A step-up 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 trasformer is

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

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 eletron 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, their attraction force at the opposite
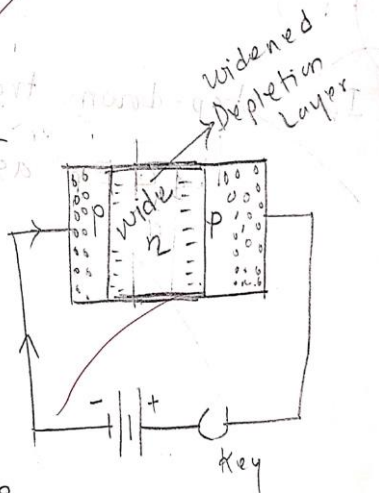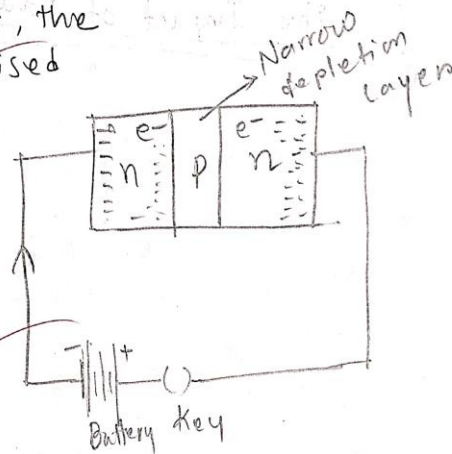

Fig# Forward biasing in a circuit.

---

molecules catti 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 or 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:
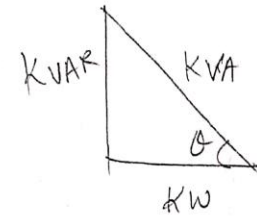
where,
KW = electricity
KVA = voltage

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

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 lower 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.
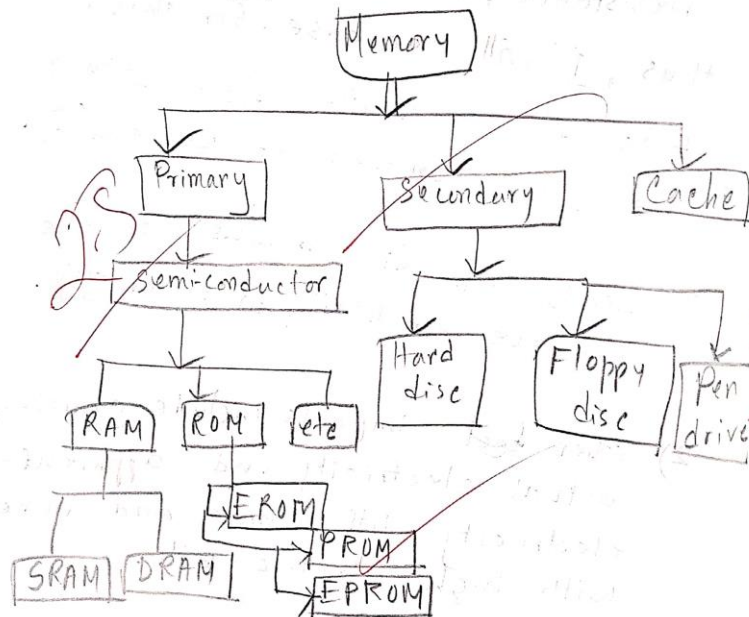

Computer and Information Technology

(01)

The classification of Computer Memory:

Memory
→ Primary
→ Secondary
→ Cache

Primary → Semi-conductor → RAM, ROM, etc.
RAM → SRAM, DRAM
ROM → EROM → PROM → EPROM

Secondary → Hard disc, Floppy disc, Pen drive

Question-02

The Difference between Hard System Software and Application Software:

the differences are—

Topic	System Software	Application Software
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 on 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: 10

Flow chart:

Answer to Question NO: 1D

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 Error 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 the "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 n 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 mag managed is called DBMS.

The Main Functions of DBMS:

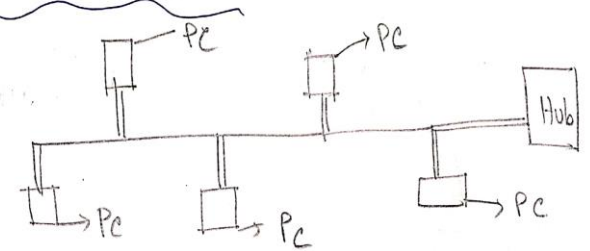The main functions of DataBase Management System are —

(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 influx of data.

Answer to Question No: 08

Different Types of Topology:
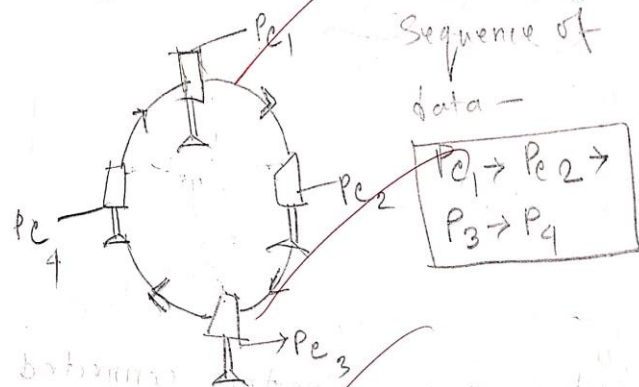
BUS Topology:

Fig# BUS Topology.

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).

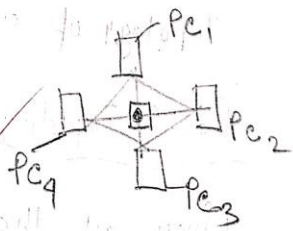### RING Topology:

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-peer Network' are -
a) ensure quick access to information;
b) ensure security of the users as 'passcodes' 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'.
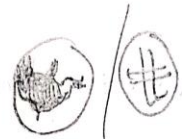
The Father of Blogging:

The father of blogging is - Evans Williams.

there can be many ways of blogging like posting on a blog site of an indiv-
-dual.

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—

(i) B2B :

The type of e-commerce where transactions are held between ~~the~~ two commercial bodies or companies ~~government~~ and doing business online.

The transactions may include whole sale purchase of milk by a business organisation from another organisation.

(ii) B2C :

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 when two consumers or customers do online transactions like in OLX.com; bikroy.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) Luminent Substance :

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

✓ Examples- different fluroscent 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.

The Four theories of Light:

(i) The particle theory of light by Isac Newton;

(ii) the wave-theory of light by Hygens;

(iii) the Quantum theory of light by Max Plank and

(iv) the electro-magnetic theory of light by 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 'quata'.

Diffraction of Light:

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

How A Billboard of Advertisment is Illuminated at Nights:

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

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

(w)

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 and incident on a metal; electrons are emitted.

Ans to Question No: 02

(a)

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.
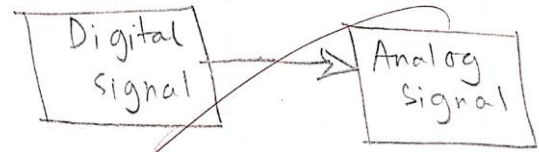
Air
(rarer)
Water
(dense)
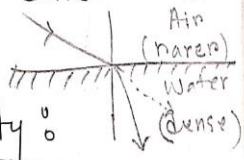
The Range of Audibility :

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.

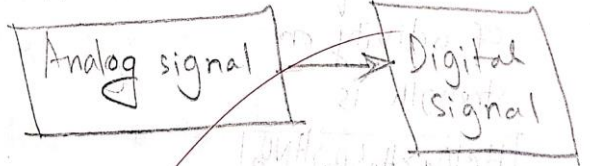
(w)

Modulation :

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

Fig# Modulation process.

Demodulation :

the opposite of modulation is called
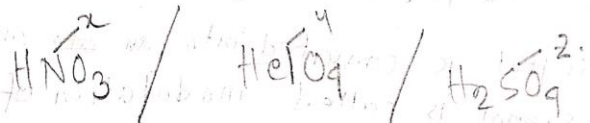

Fig# Demodulation of signal.

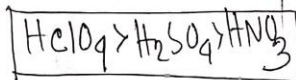The demodulation process.

Ans to Question No: 03

(a)

$$\overset{x}{HNO_3} \quad / \quad \overset{y}{HClO_4} \quad / \quad \overset{2}{H_2SO_4}$$

Let, the central oxidation number of

$N = x$,

$Cl = y$ and

$S = 2$.

So, the sequence of activity or strength is

$\boxed{HClO_4 > H_2SO_4 > HNO_3}$

HNO3

$x = -3(-2) - (1 \times 1)$
$= 6 - 1$
$= 5$

HClO4

$y = -4(-2) - (1 \times 1)$
$= 8 - 1 = 7$

H2SO4

$2 = -4(-2) - (2 \times 1)$
$= 8 - 2$
$= 6$

: Page-5

(vi)

The Reactions of Acid Rain:

$$S + O_2 \rightarrow SO_2$$
$$SO_2 + O_2 \rightarrow SO_3$$
$$SO_3 + H_2O \rightarrow H_2SO_4 + H_2O$$

→ Rain water

Acid rain

$$CO_2 + H_2O \rightleftharpoons H_2CO_3$$
$$NO_2 + H_2O \rightarrow HNO_3$$

(sv)
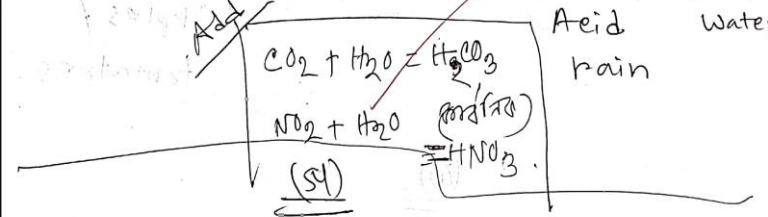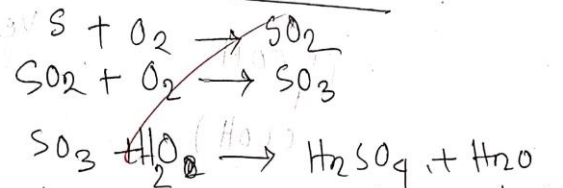
The Uses of Weak Acids in Daily life:

~~HCl~~ 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.

$$\left(\begin{array}{c} COOH \\ | \\ COOH \end{array}\right)$$

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

(w)

The Laws against Acid-Terrorism:

The Acid-Prohibition and Control Act of 2002 of our country states in Article 92, 35; 43 and others that the production of
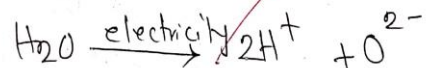
acids; supply and delivery of acids are completely restricted except for some industrial purposes.

Answer to Question NO: 04

(৪)

Electrofication:

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

$$H_2O \xrightarrow{electricity} 2H^+ + O^{2-}$$

---

(২)

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.

২| 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 Broglee,-

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

The nature of light can be described is 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.

2| How the light is Produced:

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

Whenever the electrons come back to lower energy axises of the particle, the energy gained has to emit as light. Thus, light is produced.
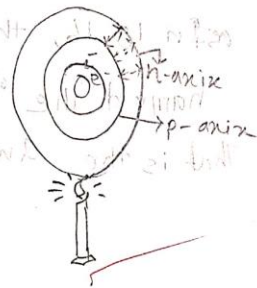
Fig: Light is produced by the energy gained by the electrons of the particle.

9| Quantum Theory of Light:
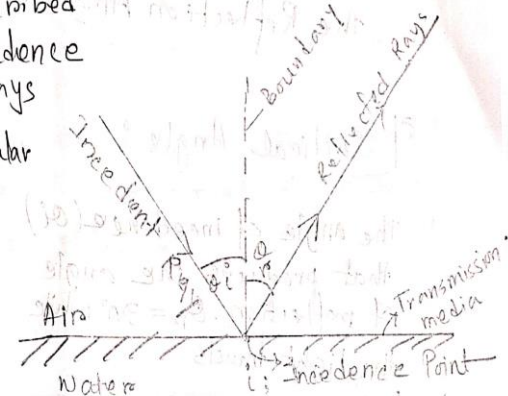
According to Man Planc's Quantum theory;

"Light is not a continuous 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 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 incedence of light rays on a particular incedence point (i) while travelling through one transparent medium to another medium and return to the same medium by the equal Incedence angle (θi) is called the Reflection of Light.

Fig: The Process of the Reflection of Light.

The Formulae of Reflection of Light:

There are two rules of reflection of light. those are —

(i) the incedent rays of light, incedence point (i); reflected rays and the transmission

medium are on a same plane.

(ii) the Incedence Angle (θi) equals the Reflection Angle (θr).

☞ Critical Angle:

The angle of incedence (θi) that produces the angle of reflection, $\theta_r = 90°$ 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:

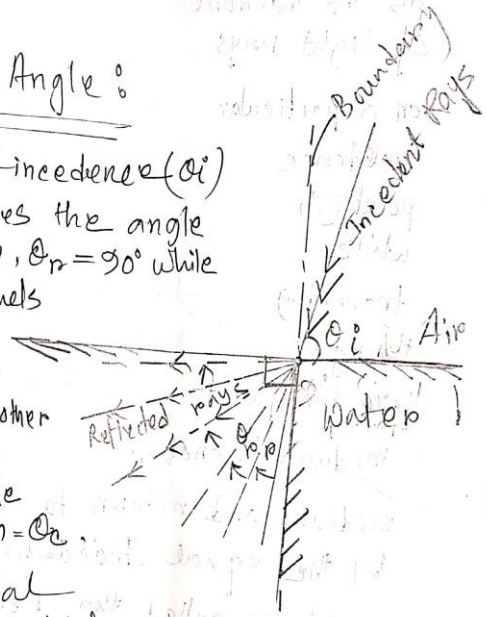From the above picture, we can see the Total Internal Reflection of light. It can be described

Fig: Critical Angle of Reflection θ_c and the Total Internal Reflection of Light.

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

উত্তর পত্র

......৪৮.... তম বিসিএস লিখিত পরীক্ষা | ২ | ০ | ১ | ৮ |

MERINA PARVIN
পরীক্ষার্থীর নাম

পরিদর্শকের স্বাক্ষর

Rajshahi   (মেরিনা পারভীন)
নিজ জেলা   স্বাক্ষর

তারিখ

প্রবেশপত্রে দেওয়া নিয়মাবলী অনুযায়ী রেজিস্ট্রেশন নম্বর, বিষয় কোড নম্বর ও
সংশ্লিষ্ট বৃত্তসমূহ সঠিকভাবে পূরণ করতে হবে।
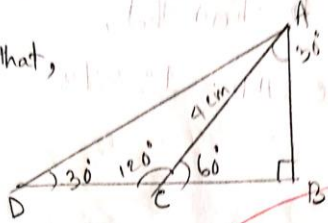
PSC রেজিস্ট্রেশন নম্বর

বিষয় কোড		
⓪	⓪	⓪
①	①	①
②	②	②
③	③	③
④	④	④
⑤	⑤	⑤
⑥	⑥	⑥
⑦	⑦	⑦
⑧	⑧	⑧
⑨	⑨	⑨

"অনুশীলনই সাফল্যের পূর্বশর্ত"

গাণিতিক যুক্তি

Answer to Question No: 11

(a) Given that,

Then,

$\angle CAD = ?$

In triangle ABC, $\angle CAB = 180° - \angle B - \angle C$

or, $\angle CAB = 180 - 90 - 60°$

or, $\angle CAB = 30°$

Now,

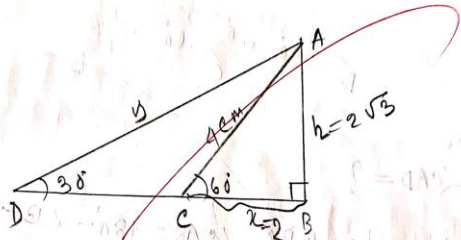In triangle ABD, ACD,

Exterior $\angle ACD = 180° - 60°$

$= 130$ [$\angle DCB = 180$]

$\therefore \angle ACD = 120°$

Therefore, $\angle CAD = 180° - \angle ADC - \angle ACD$

$= 180° - 30° - 120°$

$= 180° - 150°$

$= 30°$

$\therefore \angle CAD = 30°$ [Ans]

---

(2) We have to show that,

$$BC : AD = 1 : 2\sqrt{3}$$

L.H.S, $\dfrac{BC}{AD}$; Let, $BC = x$ and $AD = y$ and $AB = h$.

Now, $BC =$

$\cos 60° = \dfrac{x}{4}$; $\left[\because \cos\theta = \dfrac{base}{hypotenuse}\right]$

or, $\dfrac{1}{2} = \dfrac{x}{4}$; $\left[\because \cos 60° = \dfrac{1}{2}\right]$ and $AC = 4cm$ is given

or, $x = 2$

$\therefore BC = 2$ ------(i)

Again, $AD = ?$

Now, from $\triangle ABC$, we get,

$AB^2 = AC^2 - BC^2$; [$\because$ Pythagorean theorem]

or, $h^2 = (4)^2 - (2)^2$; [$\because$ from eq (i) $BC = 2$]

or, $(h)^2 = 16 - 4$

$\therefore h = \sqrt{12} = \sqrt{3 \times 4}$

$\therefore h = 2\sqrt{3}$ ----- (ii)

Therefore, $AD = \dfrac{AB}{\sin 30°}$; $\left[\because \sin\theta = \dfrac{perpendicular}{hypotenu}\right]$

or, $\dfrac{AD}{AB} = \dfrac{1}{\sin 30°}$

or, $\sin 30° = \dfrac{AB}{AD} = \dfrac{2\sqrt{3}}{AD}$

or, $\dfrac{1}{2} = \dfrac{2\sqrt{3}}{AD}$; $\left[\because \sin 30° = \dfrac{1}{2}\right]$

or, $AD = 4\sqrt{3}$ ------(iii)

From (i) and (iii)

$$\frac{BC}{AD} = \frac{2}{4\sqrt{3}}$$

or, $\frac{BC}{AD} = \frac{1}{2\sqrt{3}}$

or, $BC : AD = 1 : 2\sqrt{3}$

(Shown)

Answer to Question NO: 07

General Enunciation:
ABC is an equilateral triangle. AD is perpendicular to BC. Prove that $4AD^2 = 3AB^2$.

Particular Enunciation:
Let, ABC be an equilateral triangle of which AD is perpendicular to BC. And $AB = BC = CA$ as equilateral triangle. We have to prove that $\boxed{4AD^2 = 3AB^2}$.
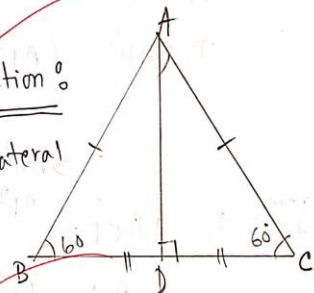

Proof: In triangles $\triangle ABD$ and $\triangle ACD$,

$AB = AC$; [given]
$AD = AD$; [common side]
$\angle ADB = \angle ADC = 90°$; [$\because AD \perp BC$]
$\therefore \triangle ABD \cong \triangle ACD$; [by SAS theorem]

$\therefore BD = CD = AD$ ——— (i)

Now, In $\triangle ABD$,

$AB^2 = AD^2 + BD^2$; [by Pythagorean theorem]

or, $3AB^2 = AD^2 + CD^2$

or, $3AB^2 = 3(AD^2 + CD^2)$ (ii)
$[\because BD = CD]$

$= 3AD^2 + 3CD^2$
$= 3AD^2 + 3(AB^2 - BD^2)$ ——— (ii)

Again, In $\triangle ACD$,

$AC^2 = AD^2 + CD^2 +$

or, $AB^2 = AD^2 + CD^2$; [$\because AB = AC$]

or, $AD^2 = AB^2 - CD^2$

$= A$ ——— (iii)

Now, L.H.S,

$4AD^2$

$= 4(AB^2 - CD^2)$; $\because AD^2 = AB^2 - CD^2$

$= 4AB^2 - 4CD^2$ $[AD^2 = AB^2 - CD^2]$

$$= 4AB^2 - 4BD^2 \; ; \; [BD = CD]$$

$$= 4AB^2 - 4(AB^2 - AD^2)$$

$$= 4AB^2 - 4(AC^2 - AD^2) \; ; \; [AB = AC]$$

$$= 4 \cdot 4AB^2 - 4 \big[$$

$$= 4AB^2 - 4(AD^2 + CD^2 - AD^2)$$

$$= 4AB^2 - 4CD^2$$
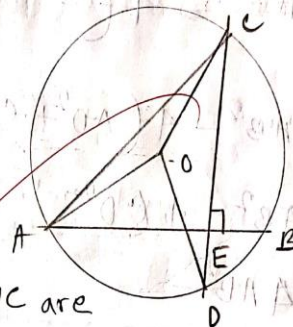
$$\boxed{= 4AB^2 -}$$

$$3AB^2 = 3AD^2 + 3AB^2 - 3CD^2$$

$$=$$

Answer to Question NO: 08

General Enunciation :

A circle with O centre, has two chords; AB and ACD intersecting each other at Point E and they intersect at 90° angle.

Prove that ∠AOD and ∠BOC are form supplementary to each other.

Particular Enunciation :

Let ABC be the circle with O centre and two chords AB and CD intersecting each other at 90° at point E. we have to prove that $\boxed{\angle AOD + \angle BOC = 180°}$

Construction: Let us join O, A ; O, D ; C, A. and O, C.

Proof : In arc AD,

peripheral cyclic $\angle ACD = \frac{1}{2}$ central $\angle AOD$

$$\therefore \; \angle ACD = \frac{1}{2} \angle AOD \quad \text{---(i)}$$

In arc BC,

cyclic $\angle BAC = \frac{1}{2}$ central $\angle BOC$

$$\therefore \; \angle BAC = \frac{1}{2} \angle BOC \quad \text{---(ii)}$$

Now, In △AEC,

exterior ∠AED = Opposite interior

$$(\angle DCA + \angle BAC)$$

= Opposite interior

$$(\angle ACD + \angle BAC) \quad \text{---(iii)}$$

Now, from (i) and (ii),

$$\angle ACD + \angle BAC = \frac{1}{2}\angle AOD + \frac{1}{2}\angle BOC$$

or, exterior $\angle AED = \frac{1}{2}(\angle AOD + \angle BOC)$;

[from equation (iii)]

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but $\angle AED = 90°$; $[\because DC \perp AB]$

$\therefore 90° = \frac{1}{2}(\angle AOD + \angle BOC)$

or, $180° = (\angle AOD + \angle BOC)$

$\therefore \angle AOD + \angle BOC = 180°$.

(proven)

Answer to Question - 09

Solution:

Given that, pth term of an arithmetic series $= q$. where $a =$ 1st term and $d =$ —mon

$\therefore a + (p-1)d = q$ ——(i) ; [as nth term $= a + (n-1)$

Similarly, qth term;

$a + (q-1)d = p$ ——(ii)

Therefore,

mth term $= a + (m-1)d$.

——(iii)

From (i) and (ii),

$a + pd - d = q$

$a + qd - d = p$.

$\underline{(-)\ (-)\ (+)\ (-)}$

$pd - qd = q - p$

or, $d(p-q) = q - p$

or, $d = \dfrac{q-p}{p-q} = \dfrac{-1(p-q)}{(p-q)}$

$\therefore d = -1$

Now, putting d's value into equation (i),

$a + pd - d = a + (p-1)d = q$

or, $a + pd - d = q$

or, $a + p(-1) - (-1) = q$

or, $a - p + 1 = q$

or, $a = q + p - 1$ ——(iv)

Now, putting d and a's value into equation (iii);

mth term $= a + (m-1)d$

$= (q+p-1) + (m-1)(-1)$

$= p + q - 1 + m(-1) - (1)(-1)$

$= p + q - 1 - m + 1$

$= p + q - m$

mth term $= \boxed{p + q - m}$

Ans.

Ans to Question : 06

(ক) L.H.S,

$$\sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$$

$$=\sqrt{\frac{(1-\sin\theta)(1-\sin\theta)}{(1+\sin\theta)(1-\sin\theta)}}$$

$$=\sqrt{\frac{(1-\sin\theta)^2}{1-\sin^2\theta}} = \sqrt{\frac{(1-\sin\theta)^2}{\sin^2\theta+\cos^2\theta-\sin^2\theta}}$$

$$=\sqrt{\frac{(1-\sin\theta)^2}{1-1-\cos^2\theta}} = \pm\frac{(1-\sin\theta)}{\cos\theta}$$

$$= \pm\left(\frac{1}{\cos\theta}-\frac{\sin\theta}{\cos\theta}\right)$$

$$= \pm(\sec\theta - \tan\theta)$$

$$= R.H.S. \quad (proved)$$

$$\therefore \cos\theta = \cos 78° \quad ; [\because \cos 78° = 2]$$

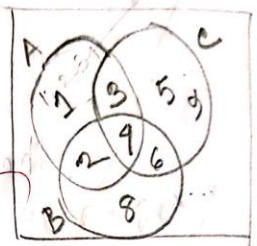$$\therefore \boxed{\theta = 78°} \quad Ans;$$

Ans to Question - 10

Given that,

$$A = \{1, 2, 3, 9\}$$

$$B = \{2, 4, 6, 8\}$$

$$C = \{3, 4, 5, 6, 9\}$$ Fig = Venn Diagram.

L.H.S, $= n(A\cup B\cup C)$

$$= n\{1,2,3,4,5,6,8,9\}$$

$$= 8$$

R.H.S,

$$n(A) = 4 \quad ; [From~diagram]$$

$$n(B) = 4$$

$$n(C) = 5$$

$$n(A\cap B) = 2 \quad ; \begin{bmatrix} common~element \\ = 3,9 \end{bmatrix} Fi~venn~diagram$$

$$n(B\cap C) = 2 \quad ; \begin{bmatrix} common \\ element = 4,6 \end{bmatrix}$$

$$n(C\cap A) = 2 \quad ; \begin{bmatrix} common = 3,9 \\ element \end{bmatrix}$$

and $n(A\cap B\cap C) = 1 ; \begin{bmatrix} all~common \\ element = 9 \end{bmatrix}$

$\therefore$ R.H.S,

$$n(A) + n(B) + n(C) - n(A\cap B) -$$
$$n(B\cap C) - n(C\cap A) + n(A\cap B\cap C)$$

$$= 4+4+5-2-2-2+1$$

$$= 13 - 6 + 1$$

$$= 14 - 6 = 8 = R.H.S.$$

$$\therefore L.H.S = R.H.S.$$

(proved.)

Answer to Question No: 01

Given that,

$$a+b+c = 10 \quad \text{---(i)}$$
$$a^2+b^2+c^2 = 38 \quad \text{---(ii)}$$

We know that,

$$(a+b+c)^2 = a^2+b^2+c^2 + 2(ab+bc+ca)$$

or, $(10)^2 = 38 + 2(ab+bc+ca)$

or, $2(ab+bc+ca) = 100-38$

$$\therefore 2(ab+bc+ca) = 62 \quad \text{---(iii)}$$

Now,

$$(a-b)^2 + (b-c)^2 + (c-a)^2$$
$$= a^2-2ab+b^2 + b^2-2bc+c^2 + c^2-2ca+a^2$$
$$= 2(a^2+b^2+c^2) - 2(ab+bc+ca)$$
$$= 2(38)-62 \; ; \quad [\because \text{from equation (iii)}]$$
$$= 76-62$$
$$= 14 . \quad \underline{Ans}.$$

Answer to Question - 02

L.H.S,

$$\frac{1}{\log_a(abc)} + \frac{1}{\log_b(abc)} + \frac{1}{\log_c(abc)}$$

$$= \frac{1}{\frac{1}{\log_{abc}(a)}} + \frac{1}{\frac{1}{\log_{abc}(b)}} + \frac{1}{\frac{1}{\log_{abc}(c)}}$$

$$= \log_{abc}(a) + \log_{abc}(b) + \log_{abc}(c)$$

$$= \log_{abc}(a \cdot b \cdot c) \; ; \quad \left[\because \log_a(abc) = \log_a a + \log_a b + \log_a c \right]$$

$$= \log_{abc}$$

$$= 1 \; ; \quad \left[\because \log_a a = 1 \right]$$

$$= R.H.S. \quad (\text{Shown})$$

Answer to Question - 09

Solution:

Given that,

Pass in Bangla = 80 %.
Pass in Math = 60 %.
Pass in Both = 160 people
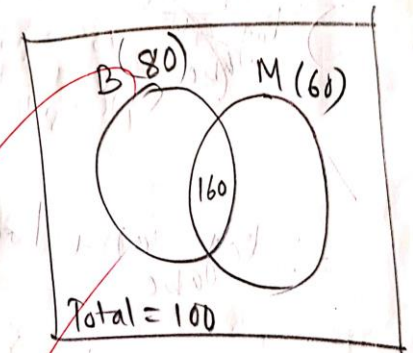Total students = ?

We know that,

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

Total = 100

Given that,

$$n(A \cup B) = 100$$

or, $100 = 80 + 60 - n(A \cap B)$

or, $100 - 190 = -n(A \cap B)$

or, $-90 = -n(A \cap B)$

$$\therefore n(A \cap B) = 90$$

Given that,
$$n(A \cap B) = n(B \cap M) = 160 \text{ people}$$

∴ 40% of total students = 160

or, $\frac{40}{100}$ of total students = 160

or, total students = $\frac{160 \times 100}{40}$

$$= 4 \times 100$$

$$= 400$$

∴ total students = 400

Ans

Solution:

Slope $m = \frac{1}{2}$

Let (3, k) point be B.

So, According to the question the

Slope, $m = \frac{y_2 - y_1}{x_2 - x_1}$

Where, $y_2 = k$, and $x_2 = 3$

$$y_1 = 3 \quad , \quad x_1 = -2$$

∴ $\frac{1}{2} = \frac{k - 3}{3 + 2}$

or, $\frac{1}{2} = \frac{k-3}{5}$ or, $2(k-3) = 5$

or, $2k - 6 = 5$

---

e-2

or, $2k = 5 + 6 = 11$

∴ $k = \frac{11}{2}$

(Ans)

Answer to Question No. 05

Solⁿ: Given that,

$$|x - 1| < \frac{1}{10}$$

or,