Malaika Khalil
Test#3
GSA (Computer + Basic Maths)

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Question#1:

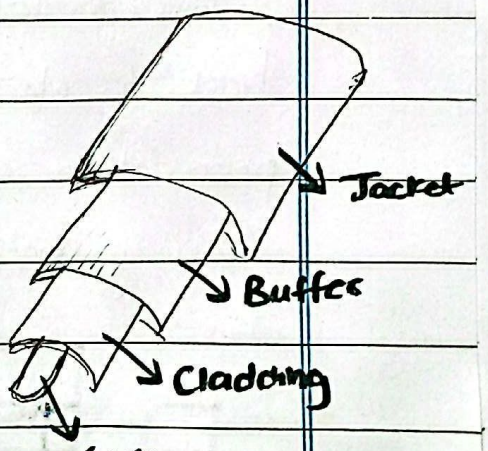
(a) Explain the working principle of optical Fibre- Explain the main importance of optical Fibre.

Introduction to Optical Fibre:

"Optical fibre is a technology that transmits information as light pulses along a hollow glass tube or plastic wire."

If light hits the glass at a shallow angle (almost 42°), it reflects back in again as the glass was a mirror- This is called total internal reflection- The structure of optical fibre contains:

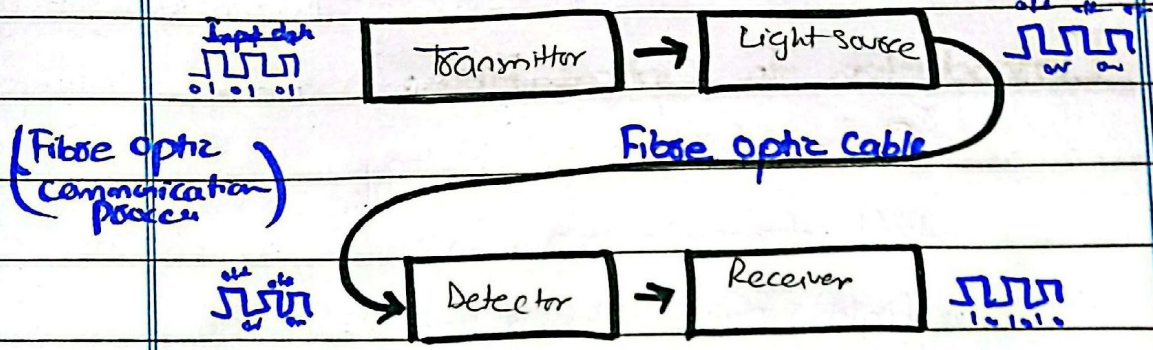
(1) Core: Light propagates here
(2) Cladding: Reduces loss of light
(3) Buffer: Provides protection-
(4) Jacket: Used to recognize wire by its yellow or red color



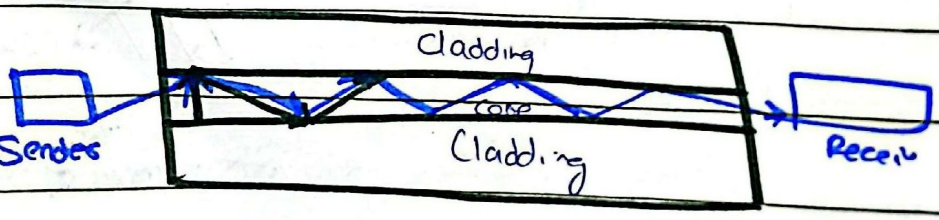
Structure of optical Fibre

Working Principle of Optical Fibre

Optical Fibre works on the principle of transmitting signal from one point to other in the form of light.



The electrical signal is given to transmitter circuit. These signals are converted to light signal using light source mainly LED whose amplitude, and frequency remains stable. Then using fibre optic cable, the light signals are transferred to receiver circuitry and transmitted back to electrical signal. The transmitter has a photo detector which checks the amplitude, frequency and phase of optic field.



→ Fibre optic Communication

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Importance of Fibre Optics:

The fibre optic has certain advantages over the copper wire:

1- **Greater Bandwith:** The greater bandwidth allows the fibre optic to transmit more information.

2- **Low Power loss:** The power loss using optical fibre is low allowing more distance for transmission i.e almost 100km compared to copper wire of 1km.

3- **Size and Weight:** The size of optical fibre i.e area is 30times less than copper wire while its strength is 4-5times more. Moreover, they are lighter in weight.

4- **Safety and Cost:** The optical fibre is a dialectic and is usually safe. ~~The cost of~~ Moreover, they are made at cheaper price.

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Optical fibre is a useful technology for transmitting signal through light. It transmits the electrical signals during its working into light signals and then again to electrical signal. They are more beneficial due to for being cheaper, lightweight, flexible and great bandwidth. However, they are expensive to install.

Part (b):

Explain the Cell phone Communication through a block diagram.

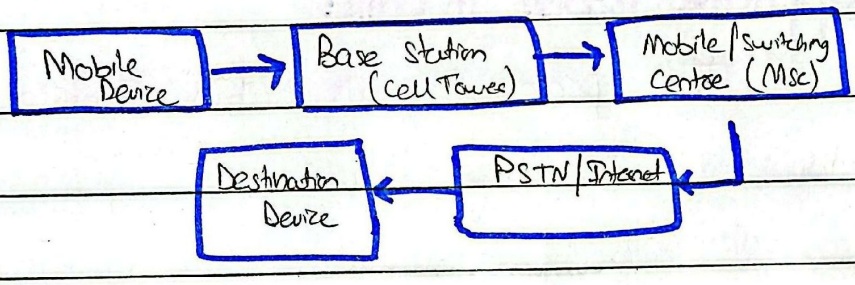
Introduction to Cell Phone:

Cell phone is a portable telecommunication device that allows users to make calls, send messages and access to internet. It works by connecting to a network of cell towers that transmit signal and enable communication even at long distance. Cell phones, are actually smart phones today containing Camera, communication system, GPS, radio

and others similar things.

Working Principle of Cell Phone Communication:

The Cellular phone or cell phone communication involves transmitting and receiving signals through a cellular network. The process uses various components, including mobile device, base station, and central switching system. Following are the steps in communication.



I. Users Mobile:

The mobile device of user converts the voice or data into radio signals.

II. Base Station (Cell Tower):

The base station or the cell tower receives the signals and forwards them

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to the Mobile Switching center.

III. **Mobile Switching Center:**

The mobile switching center manages the call routing, switching and connecting to other networks.

IV. **Public Switched Telephone Network (Internet):**

It handles the communication with landlines or other internet-based services.

V. **Opposite Process in Calls:**

The process repeats but in opposite order for incoming data.

Part (c)

Briefly explain Satellite. Define the working principle of GPS.

Introduction to Satellite:

A satellite is an object that orbits around earth or any other planet.

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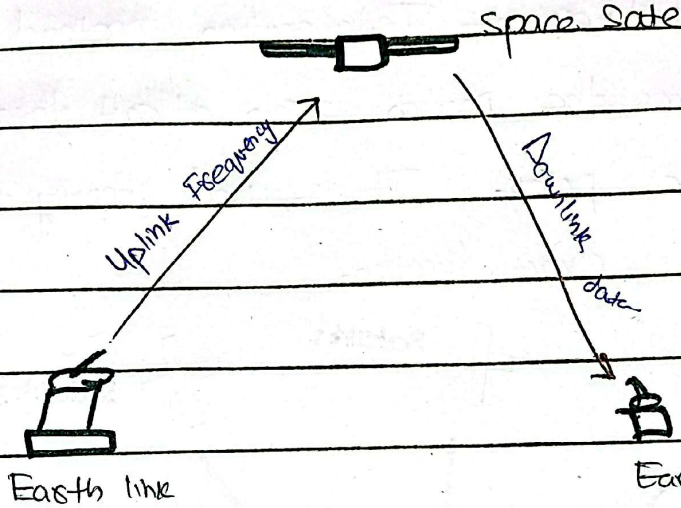
Satellites are either natural i.e. ~~star~~ moon, or earth and can be artificial i.e. man-made satellite. It uses the radio signals to help and determine location. Moreover, it is used in weather forecasting, any kind of environmental monitoring.



The general signal from earth satellite is sent and ~~modulate~~ the signal is modulated through uplink. Then, after processing or amplifying it is downlinked to the earth satellite.

Understanding the Global Positioning System (GPS):

The GPS is a satellite-based navigation system that provide accurate location,

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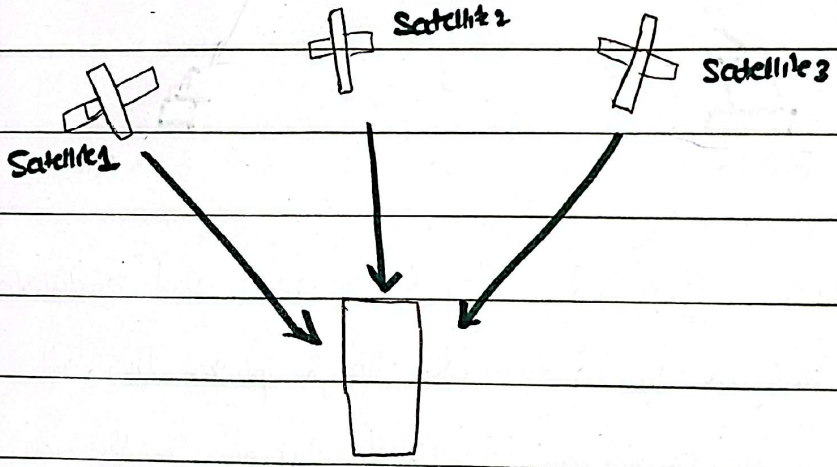
Velocity and time related information anywhere on Earth. It is used in navigation, map, tracking and other purposes.

Working Principle of GPS:

The GPS works based on the principle of trilateration. Trilateration method determines the position from atleast three reference points. It is used mostly for receiver's exact location.



The transmitter GPS sends information about the position and time to the receiver GPS at fixed intervals through radio waves (signals).

By finding the difference in time between the signal sent from GPS ~~signal~~ satellite to the

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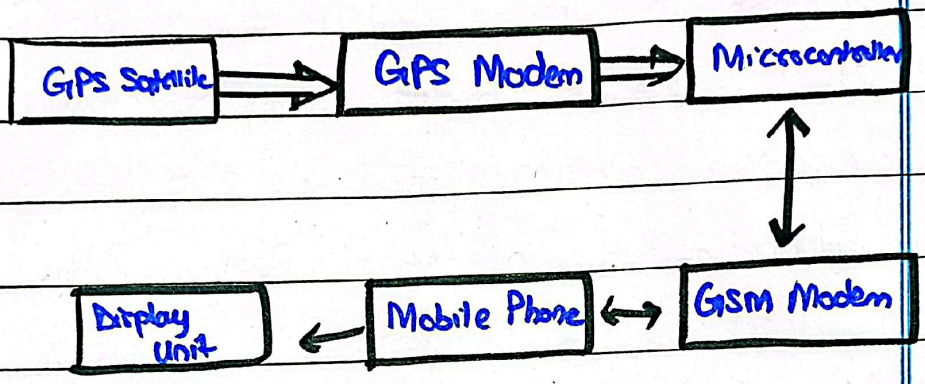
time the GPS receives, the distance between GPS receiver and the satellite can be calculated. Using the trilateration process, the receiver locates its position as the signals are obtained from atleast three satellites.



* Block Diagram of GPS

Working

Thus, GPS is a satellite based navigation system which is used to obtain the information from space regarding weather forcasting, climate change and obtaining position and location.

Part (d)

Differentiate between RAM and Rom.

Introduction to Internal Memory of Computer:

Internal memory of computer refers to the storage system of computer. It operates at highest speed and it can be accessed by the Central Processing Unit (CPU). It is present on the computer chip and electronic circuit is used to store the information, either in form of ROM or RAM.

Key Differences Between RAM and ROM:-

	RAM	ROM
(1)	RAM stands for Random Access Memory.	ROM stands for Read only Memory
(2)	The temporary memory which is used by the system to store data for temporary use.	The permanent memory used to store the data for permanent or later use.

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(3)	It is used for running programs and applications.	It is used for storing information, data and files.
(4)	The volatile memory is lost when the computer is turned off.	The volatile memory remain in the computer even if it is turned off.
(5)	The data can be modified frequently.	Read Data is to be read only as it cannot be modified.
(6)	It is fast and enhances the speed of computer.	It is slower than Ram.
(7)	The size is mostly in GigaBytes (GB) i.e. large.	The size is (MBs & KBs)
(8)	They are mostly DRAM, or SRAM	They are mostly PRom, EPRom.

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Question #2:-

(a) Two numbers are in ratio ... smaller number is?

Two numbers = 3 : 5

$x : y = 3 : 5$ —(1)

If 9 subtracted from each :- $\frac{x-9}{y-9} = \frac{12}{23}$

$23(x-9) = 12(y-9)$

$23x - 198 = 12y - 108$ —(2)

From eq(1)

$x = \frac{3}{5}y$

Now eq(2) becomes:

$23\left(\frac{3}{5}y\right) - 198 = 12y - 108$

$\frac{69}{5}y - 198 = 12y - 108$

$13.8y - 12y = -108 + 198$

$1.8y = 98$

$y = \frac{98}{1.8}$

$\boxed{y = 54.4}$

Put in eq(1)

$x = \frac{3}{5}(54.4) \Rightarrow$ $\boxed{x = 32.64}$

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(b) Three partners shared ... of their investment

Let the three partners be = A, B and C

The profit of business ratio = 5 : 7 : 8

A : B : C = 5 : 7 : 8 —(1)

Total Investment = Invested Capital x Time period of Investment

According the duration of partnership

A : B : C ⇒ 14A : 8B : 7C —(2)

From eqns and (2)

14A : 8B : 7C = 5 : 7 : 8

So,

14 A = 5 —(1)

8 B = 7 —(2)

7C = 8 —(3)

From the state formula:

$A = \frac{5}{14}$ $B = \frac{7}{8}$ $C = \frac{8}{7}$

So, $A : B : C = \frac{5}{14} : \frac{7}{8} : \frac{8}{7}$

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The LCM of 14, 7 and 8 is 56 - So,

$$A:B:C = \frac{5}{14}\times 56 : \frac{8}{7}\times 56 : \frac{7}{8}\times 56$$

$$\boxed{A:B:C = 20:64:49}$$

(c) **The avg weight .... weight of B?**

The average of A, B, and C is 45kg - So,

$$\frac{A+B+C}{3} = 45$$

$$A+B+C = 135 \quad \text{---(1)}$$

The average of A and B is 40 - So,

$$\frac{A+B}{2} = 40$$

$$A+B = 80 \quad \text{---(2)}$$

Then, the average of B and C is 43kg

$$\frac{B+C}{2} = 43$$

$$B+C = 86 \quad \text{---(3)}$$

Adding eqn (2) & (3)

$$A+B = 80$$

$$\underline{C+\quad +B = 86}$$

$$C+A+2B = 166 \quad \text{---(4)}$$

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Subtracting eq (1) from eq (4)

$$A + 2B + C = 166$$
$$\ominus A \ominus B \ominus C = \ominus 135$$

$$B = 31$$

So, the weight B is 31kg

(d) Find a positive number ... of the number.

Let the number be 'x'.

So,

$$x + 17 = 60\left(\frac{1}{x}\right)$$

$$x + 17 = \frac{60}{x}$$

$$x^2 + 17x - 60 = 0 \quad \text{— (1)}$$

Appling quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$a = 1$ $\quad b = 17$ $\quad c = -60$

So,

$$x = \frac{-17 \pm \sqrt{(17)^2 - 4(1)(-60)}}{2(1)}$$

$$x = \frac{-17 \pm \sqrt{289 + 240}}{2}$$

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$$x = \frac{-17 \pm \sqrt{529}}{2}$$

$$x = \frac{-17 \pm 23}{2}$$

$$x = \frac{-17+23}{2} \quad ; \quad x = \frac{-17-23}{2}$$

$$x = \frac{6}{2} \quad ; \quad x = \frac{-42}{2}$$

$$\boxed{x = 3} \quad ; \quad \boxed{x = -12}$$

As, $x = 12$ is a negative number.

So,

the positive number would be 3.