GSA Test 8

Question 1

a) Working principle of optical fiber. Enlist main importance of fiber optics.

Optical fibers are thin strands of glass or plastics. They are thin like hair and they carry packets of energy in the form of light. They work on the principle of "Total internal Refraction".

Working of Optical Fibers.

To understand its working some diagrams needs to be discussed.

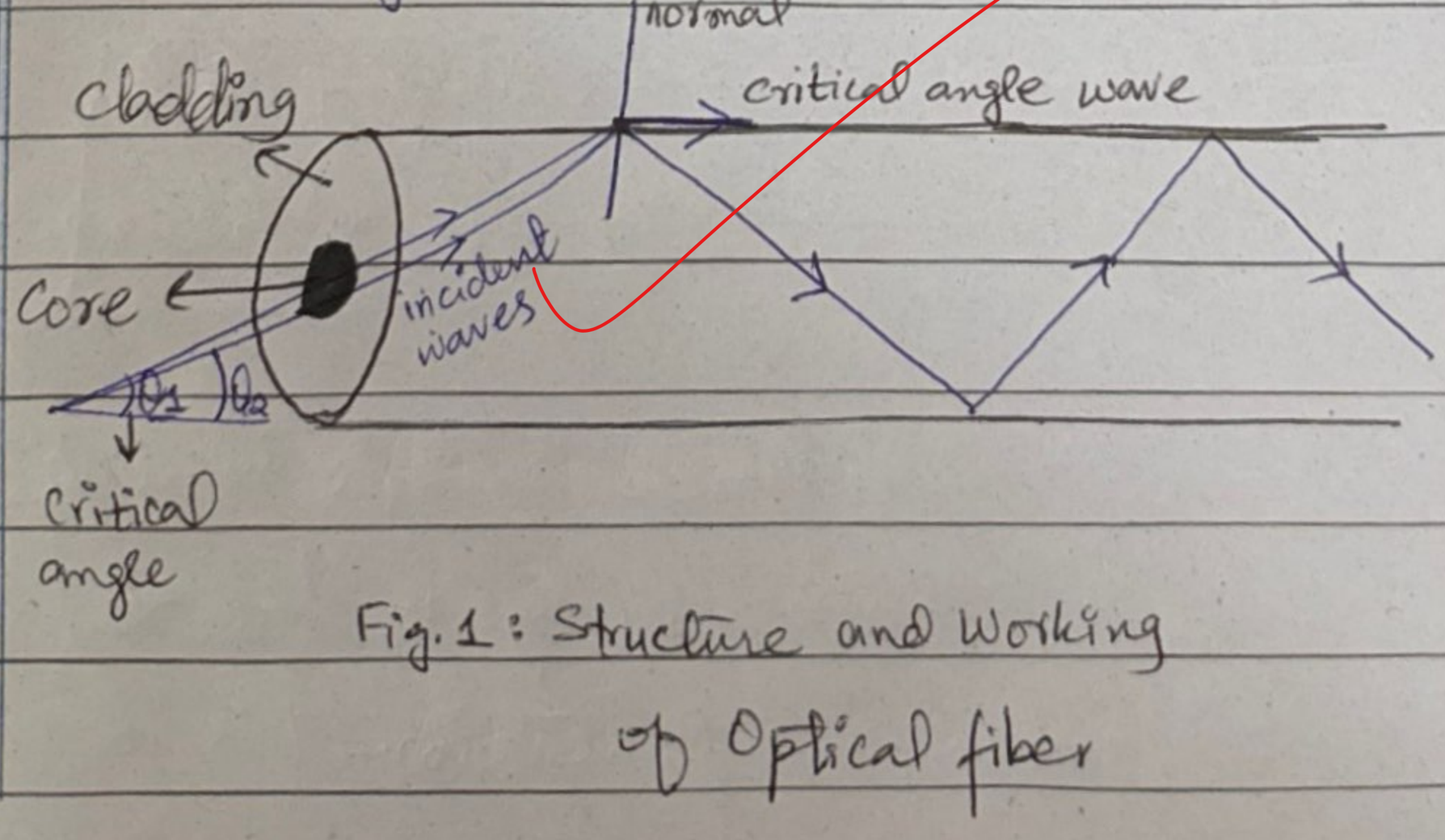


Fig. 1: Structure and Working of Optical fiber

تاریخ: / /

Core: centre of optical fibers. High density which cause more bending of light.

Cladding: The outer layers of core. It has relatively less density.

Core > Cladding

Critical Angle: The angle that bends the light at 90°. Any further increase in angle will then cause total internal reflection

Total Internal Refraction: Refraction means bending of light. Total internal refraction means that the light waves do not leave the optical fibers and are refracted inside. Thus, carrying data.

How light travels along optical fiber?

It travels through bending of light. This bending is due to total internal refraction. Plus it

travels at the speed of light i.e 3.0×10^8 m/s. The greater the area of core more information can travel.

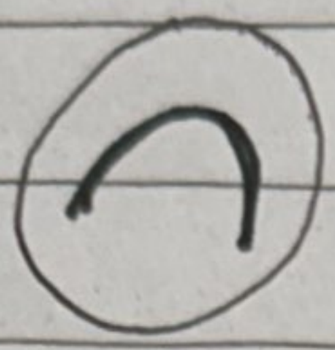


Fig 2a: Bending of light

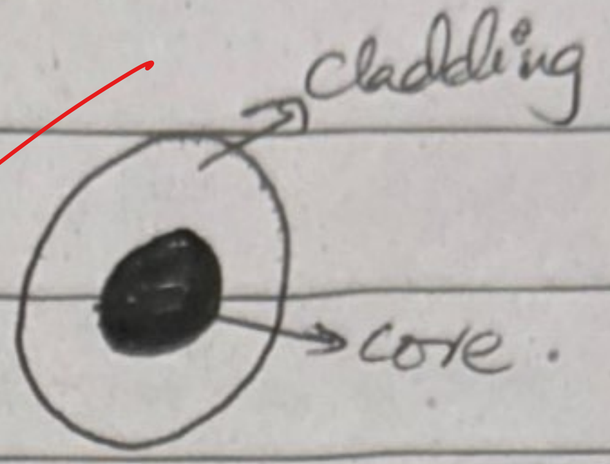


Fig 2b: Crosssectional view of optical fiber.

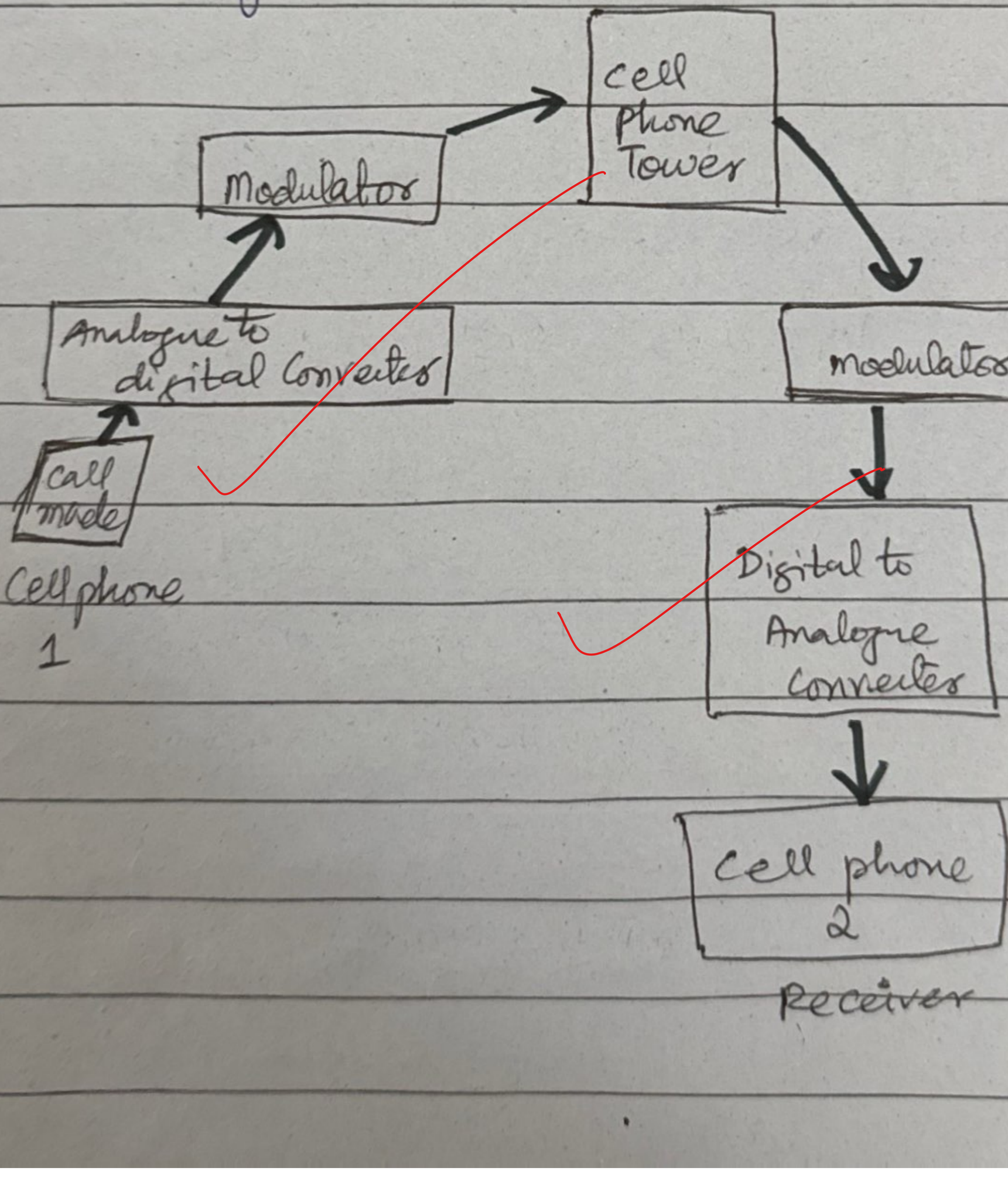
Importance of Optical Fiber

1. Transfering of data from one place to another
2. Fastest mode of data transfer
3. Safe and secure method
4. Safe and not impacted by harsh weather conditions
5. Expensive but reliable method.
6. Can work even in sea, thus helps in connecting the world.

تاریخ: ___/___/___

b. Cell phone communication through block diagrams.

Cell phones are devices that connect the people throughout the world. One can not only hear eachothers voice or text messages but can also see eachother through video calls. Their working is explained through following block diagram.



Explanation of Block Diagram.

Cell phone one makes a call to receiver on cell phone 2.

↓

To convert the Analogue data into bit and bytes it is passed through Analogue to Digital Converters as it is easy to transfer data using Zero's and One's

↓

This data transfer is through Electromagnetic wave i.e Radio wave. It travels with speed of light has frequency 1×10^4 and wave lenght of 10^3 m.

↓

It is passed through a modulator.

Depending upon the modulator the data is either modulated on basis of → Amplitude
→ phase
→ frequency

This helps prevent data loss.

↓

It then is transfered to cell phone tower.

↓

From tower it is directed to the locality where the receiver is

↓

To its cell phone tower it is directed to a modulator who now demodulates the data

↓

Then to the receiver cell phone where it is convelled to Analoge signal.

↓

In the end the receiver receives the call.

Thus, this is how cell phones work.

تاریخ: ___/___/___

c) Briefly explain satellites. Define working of GPS.

There are two kinds of satellites i.e Natural and Artifical satellite. Natural satellites mean moon. and artifical ones are many but one of them is Geo-stationary Satellite. They are called satellites because the orbit the earth.

Geostationary Satellite

These satellites orbits the earth. They are overing a fixed part of earth. They also move in the same motion as the earth moves on its axis. They move anticlockwise. A total of 3-4 geo-stationary satellites are rotating around earth.

Natural Satellite

Unlike other man made satellites they are not launched by humans and they do not need fuel to operate. It follows the concept of centripetal force which is;

$$F = \frac{mV^2}{R}$$

m = mass of object

V = velocity

R = radius of circle in which they are orbiting

Geo Positioning Satellites

There are around 24 GPS for earth. They are launched and their purpose is to locate objects on earth. They work in following manner:

تاریخ: ___/___/___

24 GPS satellites in earth's orbit

↓

Detects an object

↓

Send signal to GPS tower

↓

Sends signal to another near GPS

↓

GPS tower Receives signal

↓

Compare speed, position and time to detect object motion and direction

3

تاریخ: ___/___/___

Thus, this is how GPS can detect objects on earth using geo-positioning satellites. It helps people find roles and are called GPS systems.

D) Differentiate Between RAM and ROM.

↓

Both RAM and ROM are primary source of storage. Their purpose is to store data. Their differentiation is as follows.

RAM	ROM
Random Access Memory	Read Only memory
Volatile memory	Permanent memory
More storage facility	Less storage facility

Also non-volatile (NOR-flash)

تاریخ: ___/___/___

Fast data access	Slow in data processing
Can be altered i.e data can be added or deleted	Fixed can not be altered Can be changed through a special process
Expensive	Inexpensive
Example PRAM	Example EPROM

Question 2

c. Average weight = $\frac{\text{Weight of all members}}{\text{Total number of people}}$

$$\text{Average} = \frac{A+B+C}{3}$$

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

$$A+B+C = 135 \rightarrow (1)$$

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

$$A+B = 80 \quad (1)$$

$$A = 80 - B \rightarrow (2)$$

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

$$B+C = 86$$

$$C = 86 - B \rightarrow (3).$$

Substituting equations (2) and (3) in equation (1).

$$80 - B + B + 86 - B = 135.$$

$$80 + 86 - B = 135.$$

$$166 - 135 = B$$

$$B = 31 \Rightarrow B = 31\text{kg}$$

Hence weight of B = 31 kg.

d) Let the unknown number = x.

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

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

$$x^2 + 17x - 60 = 0$$

Solving the Quadratic equation through factorisation method

$$x^2 + 17x - 60 = 0$$

$$x^2 - 3x + 20x - 60 = 0$$

$$x(x-3) + 20(x-3) = 0$$

$$x = -20 \quad x = 3.$$

As x is positive therefore $x = 3$ Ans.

Rough work.

$1 \times 60 = 60$

$3 \times 20 = 60$

$-3 + 20 = 17$

5

b) 5 : 7 : 8 .

Sum of ratios = 5 + 7 + 8 .

= 20 .

% of each ratio

$\frac{5}{20} \times 100^{5}$ $\quad$ $\frac{7}{20} \times 100^{5}$ $\quad$ $\frac{8}{20} \times 100^{5}$

25 % $\quad$ 35 % $\quad$ 40 %

25 x 14 $\quad$ 8 x 35 $\quad$ 40 x 7 .