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CSE
course code: CSE 443
course : Mobile & Telecommunication

Ans: to the! Q. NO: 01

(a) <u>Data communication</u>: Communication is defined as a process in which more then one computer transfer information, instructions to each other and for sharing resources. or in other words, communication is a process or act in which we can send or receive data. A network of computers is defined as an interconnected collection of autonomous computers, Autonomous means no computer can start, stop or control another computer.

<u>Component of data communication</u>:

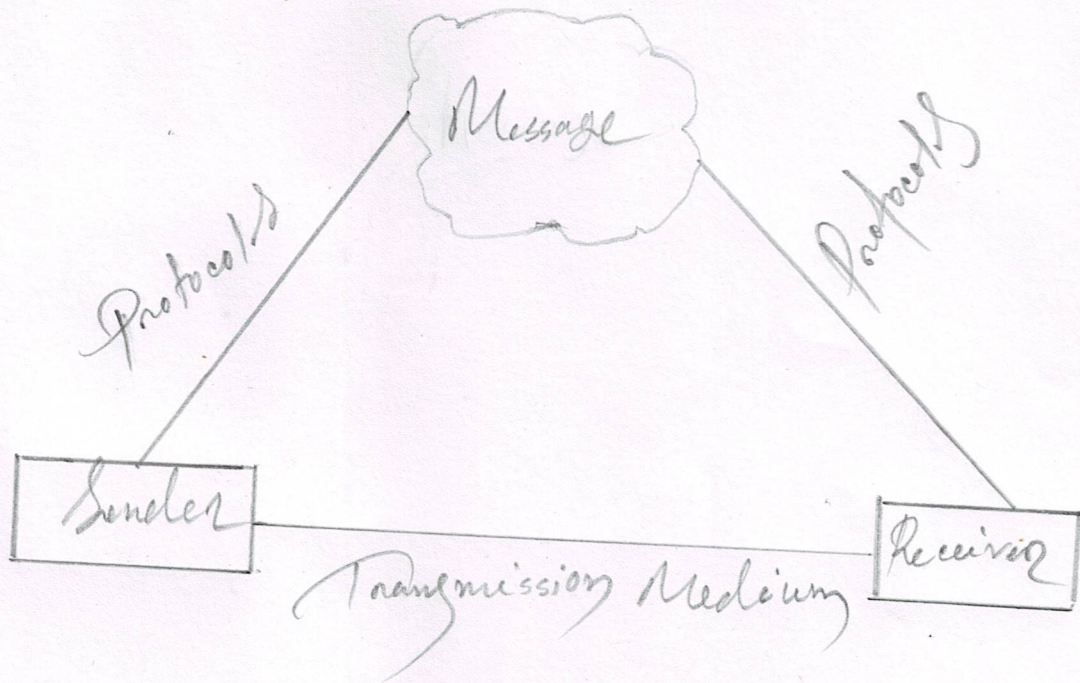A communication system made up of the following components:-

1. Massage
2. Sender
3. Receiver
4. Tranmission Medium/communication channels
5. Set of rules (Protocol)

(b) Bandwidth:

The term "bandwidth" refers to the quantity of data that that may be sent message a specific network connection or link in a particular time length ordinarily, it is expressed in bits per second (bps) or megabits per second (Mbps)

A network connections speed is determined by it's Bandwidth. a fundmental idea in computer networking. A wired or wireless networke available capacity is gauged by its bandwidth. It is the must data that can be moved through the web at a specific time. the faster a user can access & download data from the network, the higher the Bandwidth.

There are two primary types of Bandwidth :-
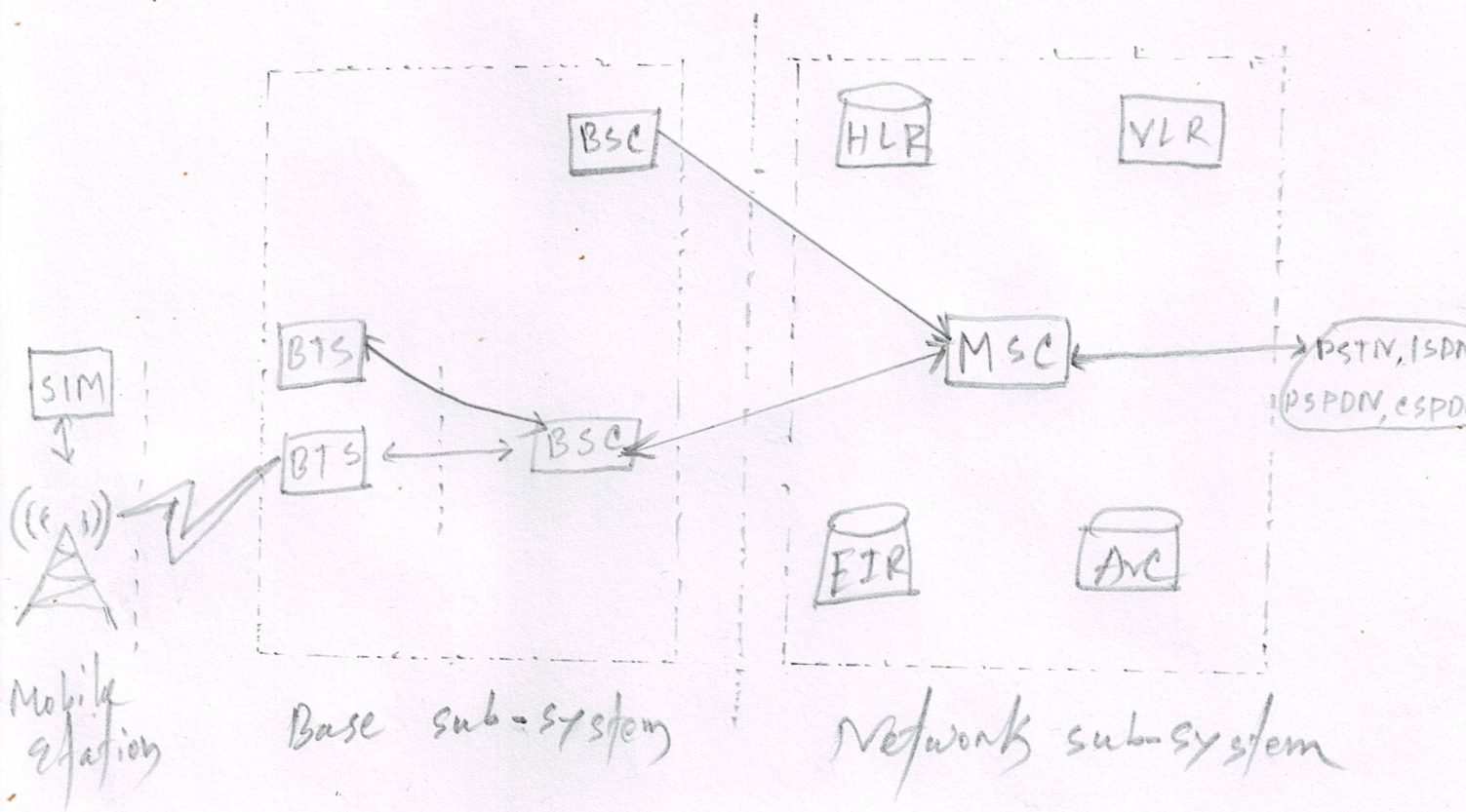
1. Symmetric Bandwidth.

2. Asymmetric Bandwith.

(a) Cellular mobile calls generate system:

Cellular mobile cell system, also reffered to as Personal communication systems (PCS) are extremely populer & lucrative worldwide type system have sparked much of the optimism about the future of wireless networks.

GSM stands for global system for mobile communication this article explains two of the functionalities of GSM networks. which are mobile-originated & mobile terminated voice calls. whether or not a call is made from the mobile station, A the mobile always communicate with the base (Transceiver station (BTS) by sending are receiving "HELLO" signals.

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BSC   HLR   VLR

SIM   BTS   MSC   →PSTN, ISDN
                     PSPDN, CSPDN

BTS ↔ BSC

EIR   AVC

Mobile station   Base sub-system   Network sub-system

GSM is the most widely used mobile communication system worldwide. It is a seecound generation (2G) mobile communication system that used digital technology to transmit voice & data. In a GSM network calls are routed & transmitted through a combination of various components such as mobile station (MS), Base station system (BSS) & mobile switching center (MSC).

Mobile originated call:

When a call is made by the user, the MS has to connect to the GSM network. For the MS first connects to a radio network, which is used for message hunting. between to set up connections between devices.

To start a call, the MS sends a request to the Base station subsystem (BSS) for creating a radio, channel between them.

A confirmation is sent by the MS implying that the radio channel has been established & the BSS can now create a connection to the MSC.

The MSC reserves a voice channel between the MSC & the BSS. The change to voice mode is notified by the BSS, & the MS return a confirmation message.

Mobile terminated call:

A terminated call in the GSM network is a call received on a mobile device. when a call is made, the country code of the phone number is used to find the location of

the receiver & also to find the msc which the subscribe is linked to.

After that all the BSC's are paged by the MSC & also the BTS, are paged by the BSC.

After that a radio channel is established between MS & BTS

Procedure for call establishment :

When a call is made to a mobile phone in a GSM network, it is first received by the nearest base station system (BSS). The BSS then establishes a connection with the mobile switches a connection with the mobile switching center (MSC) which acts as a control center for the entire network

Once the connection is established, the audio signals are transmitted between the calling & called parties through the BSS.
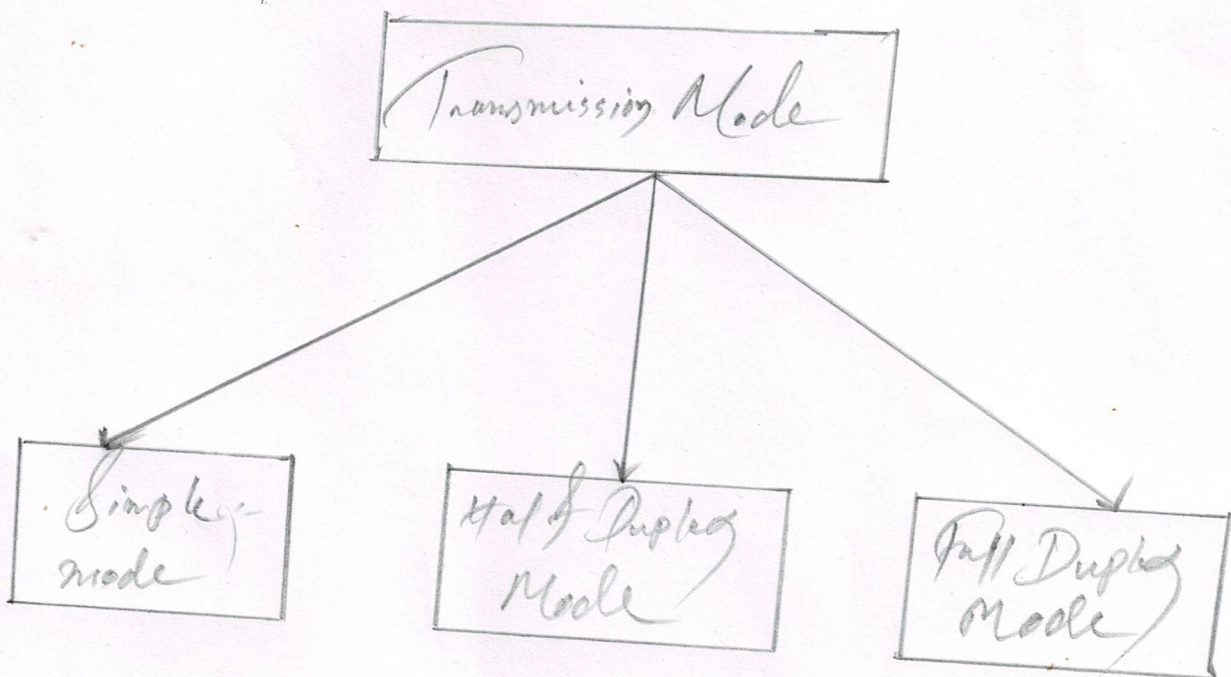
(B) Transmission Modes in Computer network :-

Transmission mode means transfering data between two dives. It's also knows as a communication mode.

There are three types of transmission mode :-

1. Simplex mode.
2. Half Duplex mode.
3. Full Duplex mode.

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            ┌─────────────────────┐
            │  Transmission Mode  │
            └─────────────────────┘
           /          │           \
          /           │            \
   ┌──────────┐  ┌──────────┐  ┌──────────┐
   │ Simplex  │  │ Half Duplex│  │Full Duplex│
   │  mode    │  │   Mode   │  │   Mode   │
   └──────────┘  └──────────┘  └──────────┘
```

These are explained as following below :-

1. **Simplex mode:** In simplex mode, the communication is unidirectional as on a One-way street. Only One of the two devices on a link can transmit, the Other can Only receive.

Example: Keyboard & traditional monitors. Thus Keyboard can only introduce input, the monitored can Only give the Output.

2. **Half-Duplex mode:** In half duplex mode, each station can both transmit & receive, but not at the same time. When One device is sending, the Other can Only receive & vice versa. The entire capacity of the channel can be utilized for each direction.

Example: Walkie-talkie in which message is sent one at a time & messages are sent in both direction.

3. **Full Duplex mode:**

In duplex mode both stations can transmit & receive simultaneously. In full duplex mode signals going in one direction share the capacity of the link with signals going in another direction, thus sharing can occur in two physically separate transmission paths, one for sending to the others for receiving. Or the capacity is divided between signals travelling in both directions.

Example: Telephone network in which there is communication between two persons by a telephone line. Thorough which both can talk & listen at the same time.

@ Network classification based on area:

There are various types of computers & networking options available. The classification of networking in computers can be done according to their size as well as their purpose.

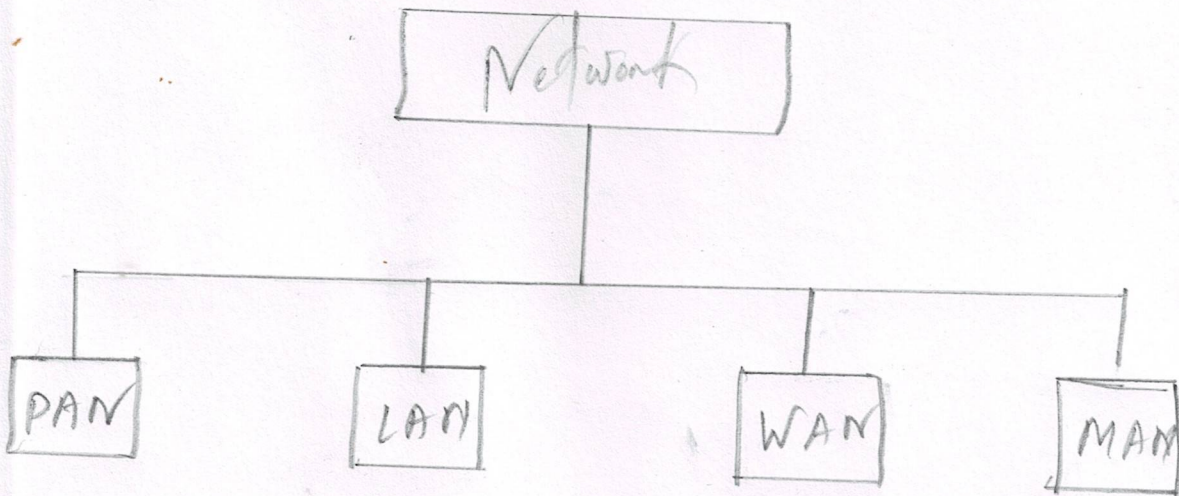Following are popular types of computer networks.

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        ┌──────────────┐
        │   Network    │
        └──────────────┘
               │
   ┌───────┬───────┴───────┬────────┐
┌─────┐  ┌─────┐       ┌─────┐   ┌─────┐
│ PAN │  │ LAN │       │ WAN │   │ MAN │
└─────┘  └─────┘       └─────┘   └─────┘
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Fig: Network classification.

PAN: PAN (Personal Area Network) is a computer network formed around a person. It generally consists of a computer, mobile, or personal digital assistant. PAN can be used for establishing communication among these personal devices for connecting to a digital networks & internet.

LAN: LAN (A local Area network) is a group of computer & peripheral devices which are connected in a limited area such as school laboratory home & office building.

It is widely useful network for sharing resources like files, printers, games & other application.

WAN: Wide Area network (WAN) is another important computer network that which is spread across a large geographical area WAN network system could be a connection of a LAN which connects with other LAN's using telephone lines & radio waves. At is monthly limited to an enterprise or an Organization.

MAN: A metropolitan Area network (MAN) is consisting of a computer network across an entire city, collage campus, or a small region.

This type of network allows you to cover an area from several miles to tens of miles.

(b) Difference between 2G & 3G cellular network :-

2G	3G
Network construction & maintenance is cheaper	Network construction an maintenence is costher
It provides slower download speed & slower access to applications.	faster access & download speed for Application
It is less secure the 3G	Highly secure as 3G network permit validation measures
video calls can not be made	video calls can be made
downloding & uploading speed is upto 236 kbps	Dowloding seed upto 21 Mbps & uploding seed upto 5 mbps
can be availed from any region	3G network is not availabe is certain regions due to the friquency problem.