Telecommunication Engineering

MD. Abdullah
ID: IT-17015
CT-03

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8. a) what are the objectives of numbering plan ? Describe the telephone number structure. 5

b) Write down the different types of frequency bands used for satelite communications. 5

c) Describe breifly Digital Switching. 4

Ans to the question no 1(a)

1.a) what is traffic engineering ? why we need to learn traffic engineering ?

Ans:

Traffic engineering is a method of optimizing the performance of a telecommunications network by dynamically analyzing, predicting and regulating the behavior of data transmitted over that network.

why we need to learn: We need to learn traffic engineering because :-

↳ The traffic engineering provides the basis for analysis and design of telecommunication networks or model.

↳ It provides means ~~for~~ to determine the quantum of common equipment required to provide a particular level of service for a given traffic pattern and volume

↳ Also determines the ability of a telecom network to carry a given traffic at a particular loss probability.

Ans to the question no 1(b)

1(b) Define Erlang and ccs. Establish a relationship between them.

Ans:

Erlang:

↳ Dimensionals unit of traffic intensity.
↳ Named after danish matematica A.K. Erlang (1878-1929)
↳ Usually denoted by symbol E.
↳ 1 Erlang is equivalent to traffic intensity that keeps
- one circuit busy 100% of the time or
- two circuits busy 50% of the time or
- four circuits busy 25% of the time

ccs:

↳ stands for Cent call seconds
↳ It is also referred as human hundred call seconds.
↳ ccs as a measure of traffic intensity is valid only in telephone circuits
↳ It represents a call time product.
↳ This is used as a measure of the amount of traffic expressed in units of 100 seconds.

relationship between Erlang and ccs: The relationship between erlang and ccs is given by,

$$1E = 36\,CCS = 3600\,CS = 60\,CM$$

Ans to the question no 1(e)

1(e). what is GOS ? Explain the term GOS breifly.

Ans:

GOS means grade of service. GOS is defined as the ratio of lost traffic to ~~offered traffic~~ offered traffic.

$$GOS = \frac{\text{Blocked Busy Hour calls}}{\text{offered Busy Hour calls}}$$

$$= \frac{A - A_o}{A}$$

where,

A_o = carried traffic

A = offered traffic

$A - A_o$ = lost traffic

The grade of service refers to the proportion of unsuccessful calls relative to the total number of calls.

The smaller the value of grade of service, the better is the service. The recommended GOS is 0.002, i.e. 2 call per 1000 offered may lost.

Ans to the question no 2(a)

2(a) Define switching. Describe circuit switching, message switching and packet switching.

Ans:

In large networks, there are ~~many~~ may be more than one path for transmitting data from the senders to the receiver selecting a path that data must take out of the available options can be understood as switching.

Circuit switching:

→ A path is established between the caller and destination.

→ Real time connection formed.

→ Example: PSTN.

Message switching:

↳ Also called store and forward

↳ A message is first stored in a buffer and then sent on its entirety step by step as resources become available.

↳ No real time connection

↳ Example: E-mail.

Packet switching:

↳ A message is broken into parts and each part is sent separately (possibly via different routes).

↳ Example: Internet UDP protocol.

Ans to the question no 2(b)

2(b). Describe space and time division switching.

Ans:

Space division switching:

↳ Connecting two channels that are ~~separating~~ separated in space.

↳ can be mechanical and/or electronic

↳ Several problems:

- slow
- Bulkly with lots of interconnect wiring.
- Subject to crosstalk.

P.T.O

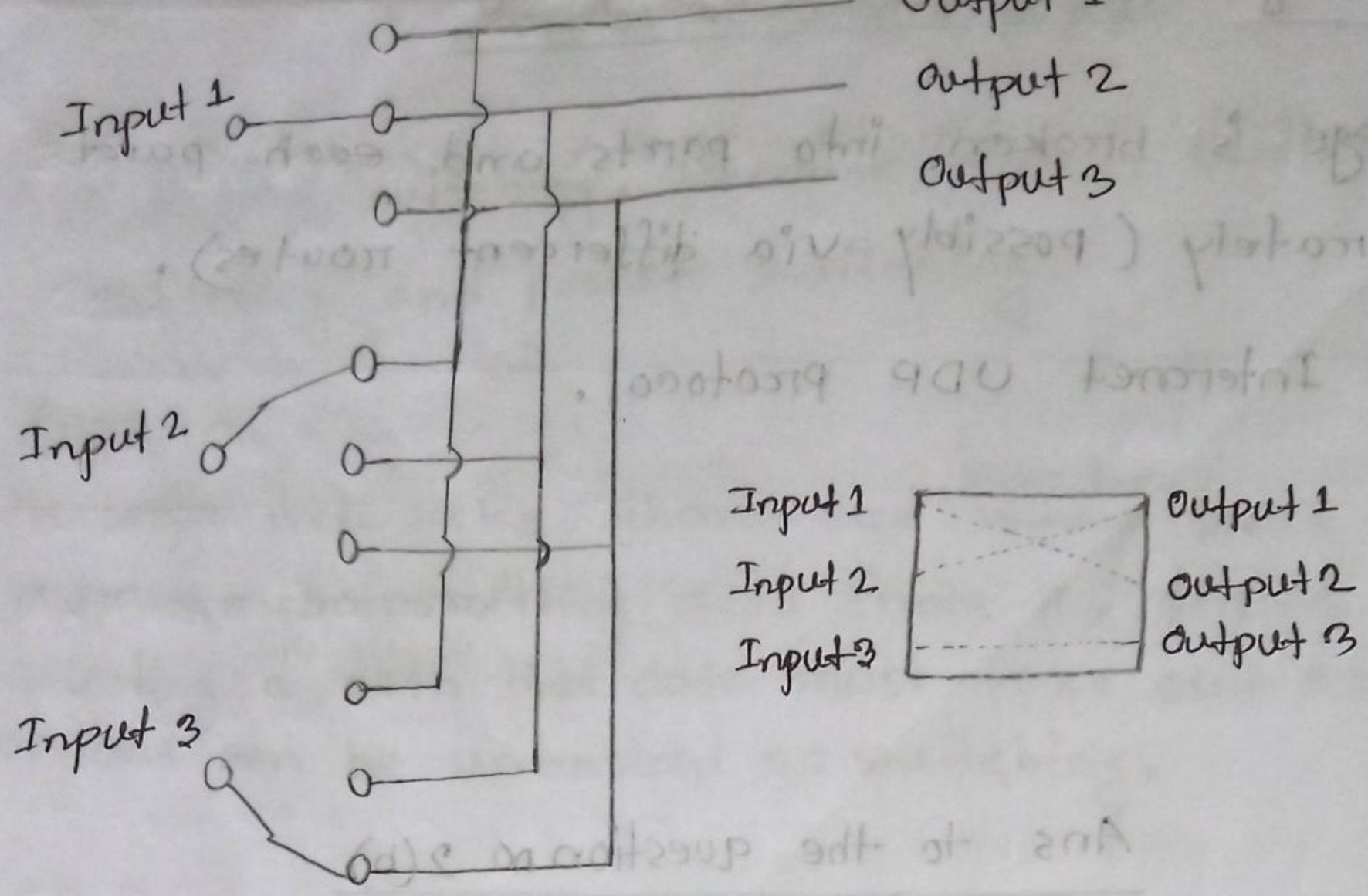


Fig- space division switching

Time division switching: Time division switching comes under digital switching techniques, where the pulse code Modulated signals are mostly present at the input and the output ports. ~~A digital~~ The incoming and ~~outgo~~ outgoing signals when received and re-transmitted in a different time slot is called time division switching. The dizitized speech information is sliced into a sequence of intervals or slots.

Time division switches ~~are~~ use time division multiplexing in switching. The two popular methods of TDM are TSI and TDM bus.

Ans to the question no 2(c)

2.c) ● Define multiplexing ? why it is needed ?

Ans:

Multiplexing: Multiplexing is the process in communication which merges two or more signals at its input into a single output, which when de-multiplexed, offers all those signals separately as they were.

Importance of multiplexing:

↳ The transmission medium is used to send the signal from sender to receiver. The medium can only have one signal at a time.

↳ ● It is used to avoid collision among multiple signals

↳ reduce network costs.

Ans to the question no 3(a)

3.a) Differentiate between circuit switching, packet switching.

Ans:

Circuit Switching	Packet switching
1. Connection oriented.	1. Connection less
2. is more reliable.	2. less reliable
3. Transmission of data is done by the source	3. Not only by the source but also by the intermediate routers.
4. Call setup is required.	4. Call set up is not required.
5. It is not store and forward technique.	5. It is store and forward technique.
6. Initially designed for voice communication.	6. Initially designed for data transmission.

Ans to the question no 3(b)

3.b) Describe crossbar switching.

Ans:

↳ A crossbar switching is a network topology.

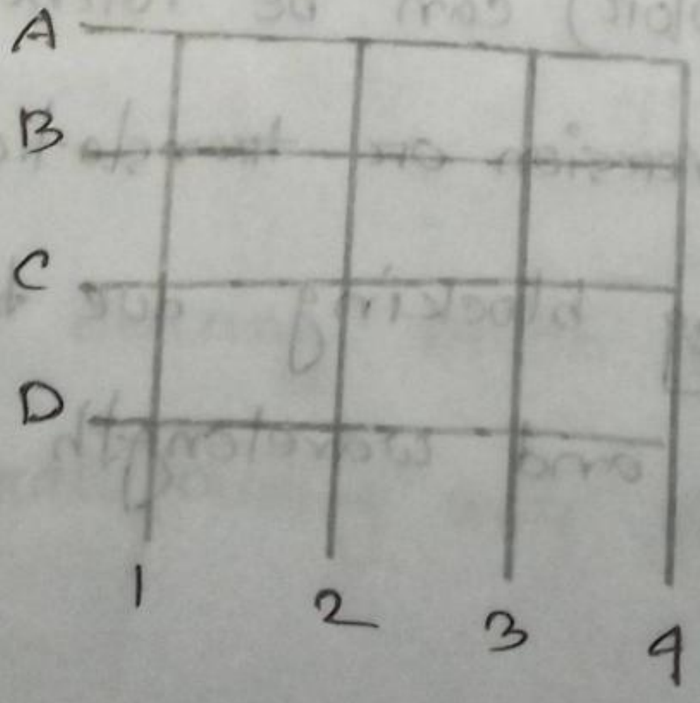
↳ Any ~~port~~ input port can be connected to any free output port without blocking

↳ The size of the crossbar refers to the number of points being connected.

Crossbar switching networks can be categorized into three major topological classes - such as

1. Full ~~consi~~ crossbar networks.
2. multistage interconnection networks
3. networks consisting of multiple levels of full crossbar connections.

Crossbar switching uses simple rectangular matrix. Actuators are operated at incoming circuits and outgoing circuits to make metallic contact and form the desired connection.



Ans to the question no 3(c)

3.c) write the points to be considered for switching network.

Ans:

Several points to be considered:

→ Blocking points to consider
→ Number of cross points
→ Reliability
→ Overload
→ Growth
→ Cost and technology

Ans to the question no 4(a)

4.a) Breifly explain the optical switching.

Ans:

optical switching:

↳ One wavelength (or color) can be turned into another.
↳ called wavelength conversion or translation.
↳ Important in reducing blocking due to wavelength contention in routing and wavelength assignment problem

↳ Optoelectronic conversion consists of optical receivers, conversion to electronic signal (O/E), and then transmitters generates optical signal at the desired new wavelength (E/O).

↳ One or several wavelengths are switched from one fibre into another.

optical switching networks are classified into three types :-

1. Optical circuit switching
2. optical packet switching
3. optical brust switching.

Ans to the q no 4(b)

4.b) Define the following terms : (i) Busy hour (ii) Peak busy hour (iii) Busy seson (iv) HDBH

Ans:

Busy hour :

One hour period during which traffic volume or call attempts is the highest overall during any given time period.

P.T.O

Peak Busy hour:

Busy hour for each day, usually varies from day to day.

Busy session:

3 months (not consecutive) with highest average daily busy hour.

HDBH:

High Day Busy Hour or HDBH is one hour period during busy session with the highest load.

Ans to the question no 4(c)

4.c) what is blocking? write down the blocking models.

Ans:

Blocking: Blocking in telecommunication systems is when a circuit group is fully occupied and unable to accept further calls.

Blocking model : Three types of blocking models

1. Blocked calls cleared (BCC)

↳ Blocked calls leave system and do not return.

2. Block calls Held (BCH)

- Blocks calls remain in the system for the amount of time it would have normally stayed for.
- If a server frees up, the call picks up in the middle and continues.
- Not a good model of real world behaviour.

3. Blocked calls wait (BCW)

- Blocked calls enter a queue until a server is available
- when the server is available, the call holding times begins.

Ans to the question no 5 (a)

5(a). what do you mean time congestion and call congestion How do they differ ?

Ans:

Time congestion:

↳ Proportion of time a system is congested (all servers busy)
↳ probability of blocking from point of view of servers.

call congestion:

↳ Probability that an arriving call is blocked.
↳ Probability of blocking from point of view of calls.

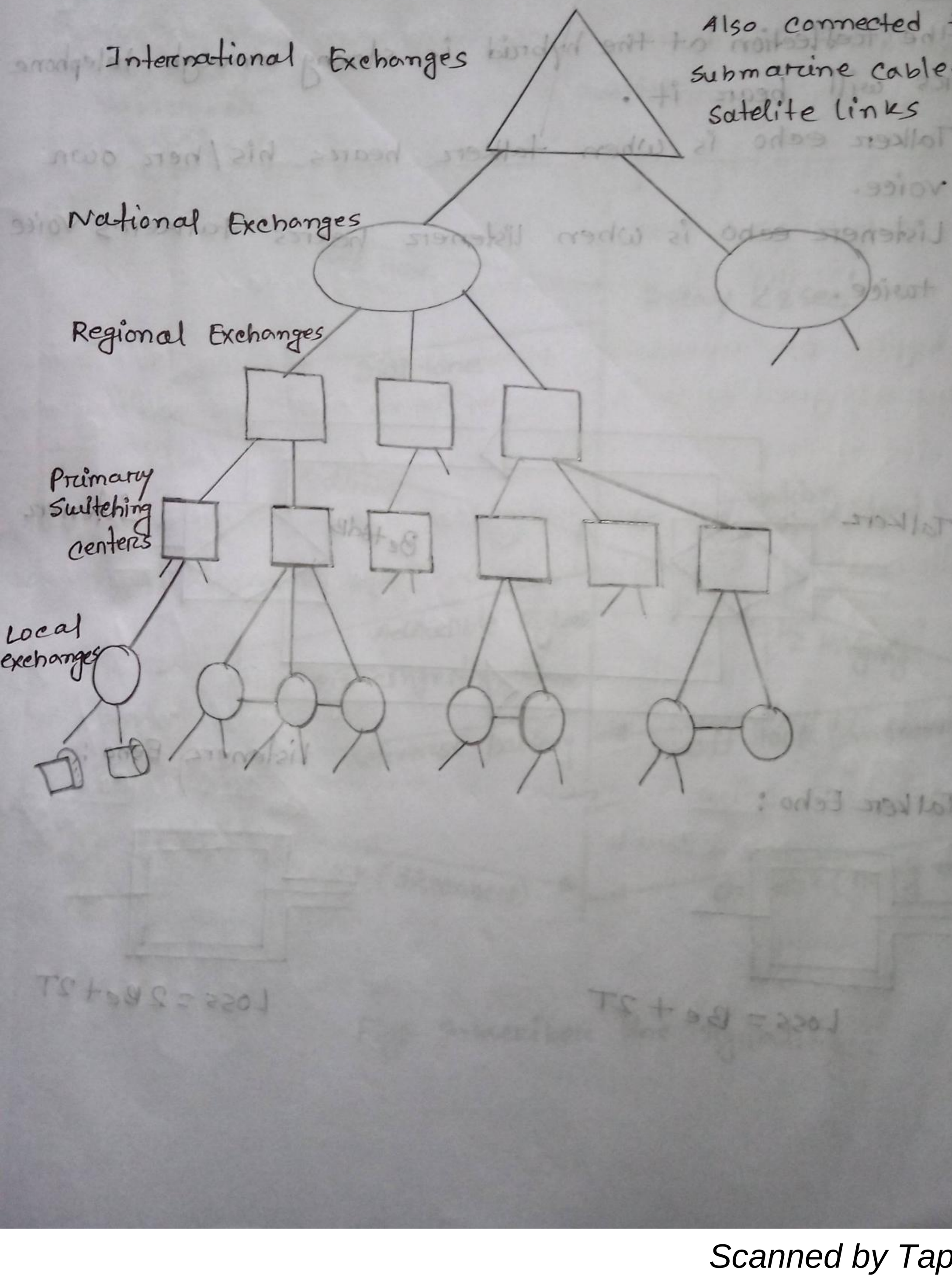
How are they different:

Time Congestion :	call congestion.:
$P(B) = P(K \geq N)$	$P(B) = P(K > N)$
Probability that all servers are busy	Probability that there are more sources waiting service that there are servers.

Ans to the question no 5(b)

5.b) Write down the PSTN Hierarchy.

Ans:



Ans to the question no 5(c)

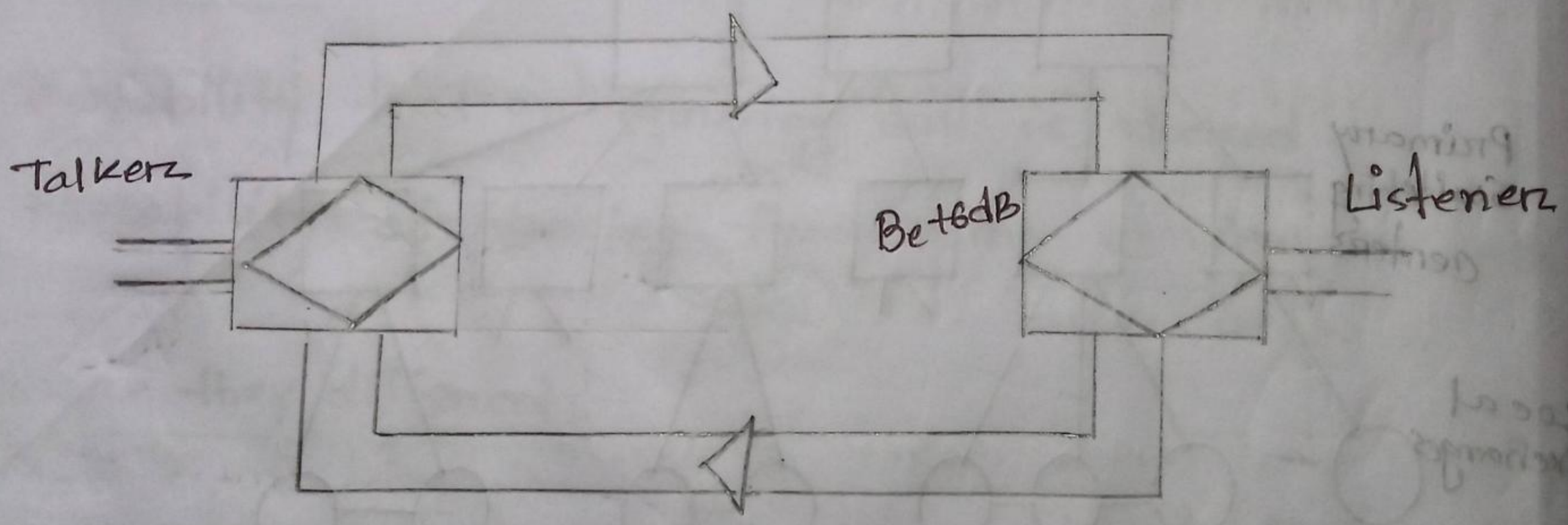
5.c) Describe breifly the Echo - Delay phenomena.

Ans:

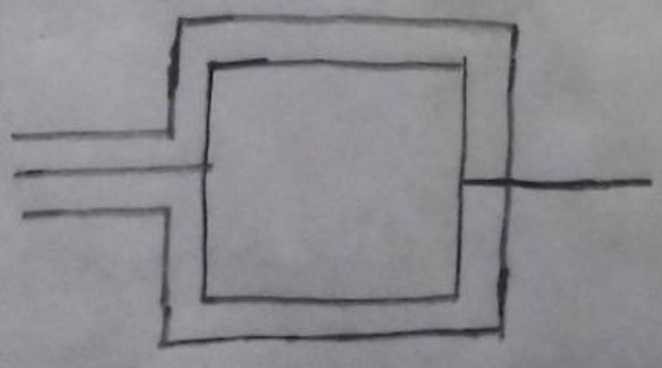
If the reflection at the hybrid is strong enough, telephone users will hear it.

→ Talker echo is when talker hears his/her own voice.

→ Listener echo is when listener hears talker's voice twice.

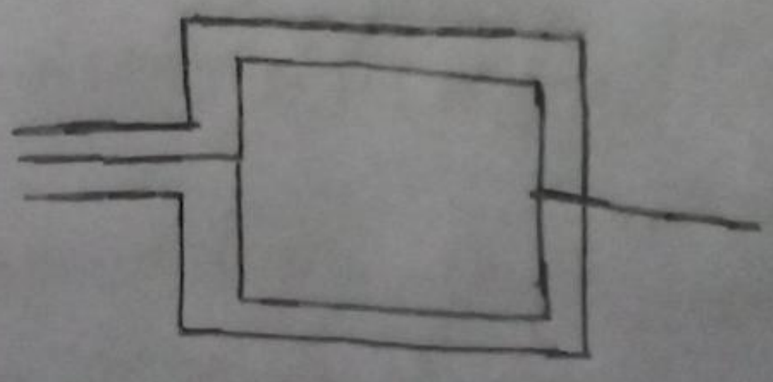


Talker Echo:



Loss = Be + 2T

Listener Echo:



Loss = 2Be + 2T

Ans to the question no 6(a)

6.a) Draw the figure of subscriberz line

Ans:

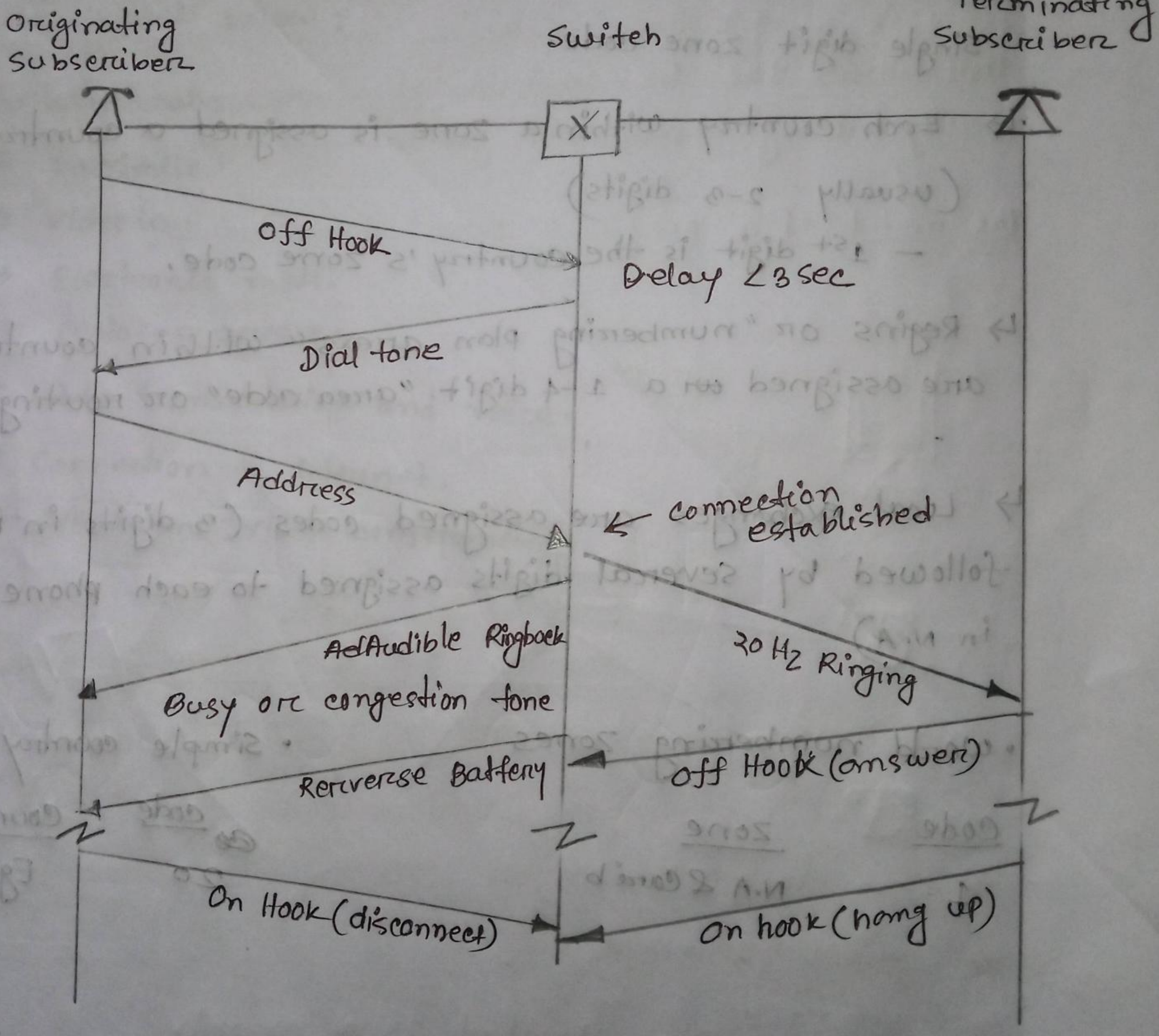


Fig:- Subscriberz line signaling.

Ans to the question no 6(b)

6(b) Describe the world telephone numberzing plan.

Ans:

↳ World is divided into zones, with each zone assigned a single digit zone code.

↳ Each country within a zone is assigned a country code (usually 2-3 digits)
- 1st digit is the country's zone code.

↳ Regins or "numbercing plan areas" within countries are assigned wi a 1-4 digit "area code" or routing code.

↳ Local exchanges are assigned codes (3 digits in N.A.) followed by severcal digits assigned to each phone (4 digit in N.A)

- world numbercing zones

Code	Zone
1	N.A & Carib

- simple country code

Code	Country
20	Egypt

Ans to the question no 6(c)

6.0c) write the services that ISDN provides.

Ans: ISDN supports variety of services. A few of them are listed below:

↳ voice calls.
↳ Facsimile.
↳ Videotext.
↳ Electronic mail.
↳ Database accesses.
↳ Data transmission and voice.
↳ Connection to Internet.
↳ Audio and video conferencing.

9t

Ans to the question no 7(a)

7.a) what is ISDN? write down the model of ISDN.

Ans:

The integrated services of digital networking, in short ISDN is a telephone network based infrastructure that allows the transmission of voice and data simultaneously at high speed with greater efficiency.

The model of a practical ISDN shown below:

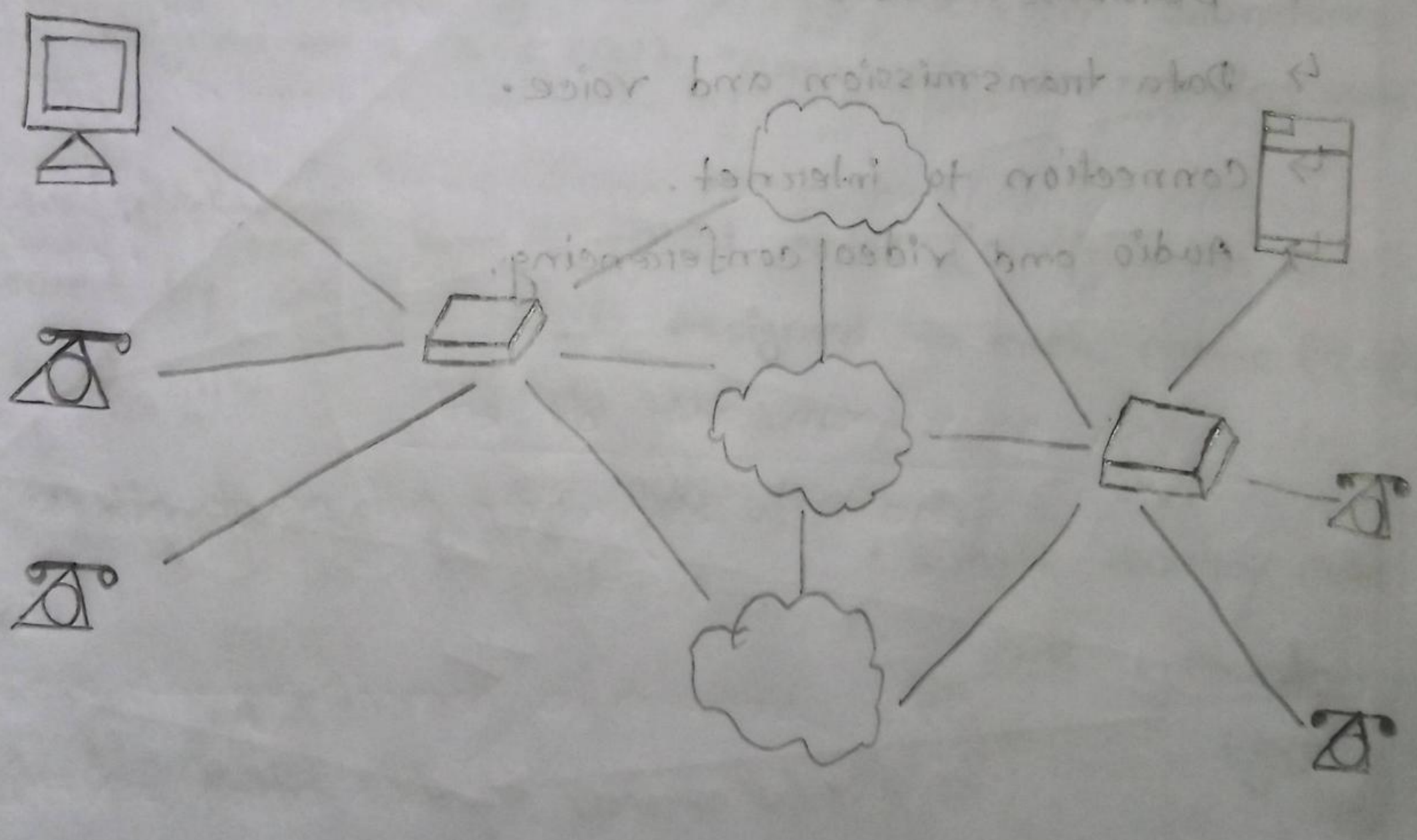


Fig- Practical ISDN model.

Ans to the question no 7(b)

7.(b) Explain the different access interfaces of ISDN.

Ans: ISDN has several kind of access interfaces such as :

→ Basic Rate Interface
→ Primary rate interface
→ Broadband ISDN
→ Narrowband ISDN.

Primary

Basic Rate Interfaces:

↳ simply called ISDN PRI connection is used by enterprises and offices.
↳ The PRI ~~can~~ configaration is based on T-carrier or T1 in the US, canada and Japan.
↳ The PRI configaration is also based on E-carrier or E1 in Europe, Austrialia and few Asian countries.
↳ used by largers organizations or enterprises.

Basic Rate interface:

↳ Simply called the ISDN BRI connection. Uses the existing telephone infrastructure.
↳ Provides two data or bearer channels at 64 kbits/sec speed and one control or delta channel at 16 kbits/se
↳ Used by smaller organization.

Narrowbom ISDN:

↳ The narrow bomd integrated serviees Digital Network is simply called the N-ISDN.

↳ It carries voice information in a narrowband of frequencies.

↳ is implemented to carry voice data.

Broadbomd ISDN:

→ The Broadbomd integrated services Digital network is called the B-ISDN.

→ This integrates the digital network services and provides digital transmission over ordinary telephone wires.

Ans to the question no 7(c)

7.c) Write down the advantages of ISDN.

Ans:

↳ Less ~~change~~ chomee of errors

↳ faster connection

↳ bandwidth is higher

↳ voice, data and video - all of these can be sent over a single ISDN line.

Ans to the question no 8 (a)

8.a) what are the objectives of numbering plan? Describe the telephone numbering structure.

Ans: The objective of numbering plan is to uniquely identify every subscriber connected to a telecommunication network.

telephone numbering structure: The numbering plans are are types such as

1. Open numbering plan : This is also called the Non-uniform Numbering plan and it premits wide variation in the number of digits to be used to identify a subscriber within a multistage-exchange area or within a country.

2. Semi-open numbering plan: This plan premits number lengths to differ by almost one or two digits. The Semi-open numbering plan is commonly used in countries such as India, sweden, uk etc.

3. closed numbering plan : This is also called the Uniform Numbering plan where the number of digits in a subscribe number are fixed. This is used in a few countries such as francee.

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Ans to the question no 8(b)

8(b) write down the different types of freqwency bands used for satelite communication.

Ans:

Band	Freqwency
L	1 to 2 GHz
S	2 to 4 GHz
C	4 to 8 GHz
X	8 to 12.5 GHz
Ku	12.5 to 18 GHz
Kidhiw	18 to 26.5 GHz
Ka	26.5 to 40 GHz

Ans to the question no 8(c)

8.c) Describe breifly digital switching.

Ans:

Digital switching: A digital switching system is one, where the inputs of any PCM highway can be connected to the outputs of any PCM highway, to establish a call.

Digital switching is divided into two main types:

↳ time switching.

↳ space switching.

Space division switching: The paths in a circuit are separated from each other, ~~specially in each other~~ spatially in space division switching. The switching system where any channel of one of its incoming PCM highway is connected to ~~the~~ any channel of an outgoing PCM highway, where both of them are spatially separated is called the space division switching.

Time division switching: The incoming and outgoing signals ~~are~~ when received and re-transmitted in a different time slot, is called time division switching.