CT-2

1(a) What is PSTN? write some major systems of telecommunication network. 5

(b) Briefly describe the public switched telephone network. 5

(c) What is cabling? Explain the subscriber loop systems. 4

2.(a) What is line signalling? write different types of signalling techniques. 4

(b) Describe in band signalling and its advantages. 5

(c) Explain the private branch exchange. 5

3.(a) What is ISDN? ~~whi~~ write which services are ISDN supports? 4

Scanned by TapScanner

(b) Write the advantages and disadvantages of ISDN. 5

(c) Explain primary rate interface. 5

4.(a) Describe wireless pre cellular systems. 4

(b) Briefly explain the advent of cellular. 5

(c) Write about the frequency reuse patterns. 5

5.(a) Define Co Channel interference reduction. 5

(b) What is free space path loss? Explain it with its formula. 4

(c) Express the free space path loss in decibels form. 5

Scanned by TapScanner

6.(a) Explain Carrier to interference ratio. 5

(b) What is fading? Explain different types of fading. 5

(c) Distinguish between flat-fading and frequency selective fading. 4

7.(a) What is registration? Describe different types of registration. 5

(b) What is roaming? List the call initiated from PSTN. 4

(c) Explain multipath fading briefly. 5

8.(a) What is FDMA? write the advantages of FDMA. 5

(b) What is CDMA? Explain mobile switching center. 4

(c) Distinguish between GSM and CDMA. 5

Scanned by TapScanner

CT-2

1.(a) What is PSTN? Write some major systems of telecommunication network?

Answer to the question no: 1(a)

Ans: PSTN stands for public switched telephone network. ~~PSTN~~ PSTN comprises all the switched telephone networks around the world that are operated by local, national or international carriers.

Any telecommunication network may be viewed as consisting of the following major systems:

→ Subscriber end instruments or equipments

→ Subscriber loop systems.

Scanned by TapScanner

→ Switching systems.

→ Transmission systems.

→ Signalling systems.

Answer to the question no: 1(b)

The public switched Telephone Network is understood as an aggregate of worlds circuit switched telephone networks, used for providing public telecommunication. The PSTN networks are called POTS (plain old telephone systems). These networks are operated regionally, locally, nationally and internationally using telephone

Scanned by TapScanner

lines, fiber optic cables, microwave transmission links or cellular Communications. PSTN Consists of switches at Centralized points on the network, which act as nodes for Communication between any point and any other point on the network.

All the types of switching techniques discussed previously, such as circuit switching, packet switching and message switching are different modes of using PSTN.

Scanned by TapScanner

Answer to the question no 1(c):

Cabling: Every subscriber has two dedicated lines Connecting to the nearest switching exchange, which are called loop lines. The laying of lines to the subscriber premises from the exchange office is called Cabling.

Subscriber loop systems: The subscriber Cable pairs from the exchange will also terminate at MDF through main feeder cables that carry large number of wire pairs. These subscriber pairs and exchange pairs are

Scanned by TapScanner

interconnected at the MDF using jumpers, which makes MDF to provide flexible mechanism for reallocating cable pairs and subscriber numbers. This means a subscriber who shifts to a different location though in the same exchange area, can be allowed to use the same number using appropriate jumper, while his old drop wires can be used by another subscriber with a new number.

Scanned by TapScanner

Answer to the question no: 2(a)

Line signalling: The network wide signalling that involves end to end signalling between the originating exchange and the terminating exchange is called the line signalling.

There are two main types of signalling techniques.

→ In channel signalling: In Channel signalling is also known as per trunk signalling. This uses the same channel, which carries user voice or data to pass control signals related to that call or connection.

Scanned by TapScanner

→ Common Channel signaling:

Common Chanel signaling uses a separate Common Channel for passing Control signals for a group of trunks or information paths. This signaling does not use the speech or the data path for signaling.

Answer to the question no: 2(b)

In band voice frequency uses the same frequency band as the voice, which is 300 - 3400 Hz, which has to be protected against false operation by speech.

Scanned by TapScanner

One such instant took place when a lady's voice which has generated a tone at around 2600 Hz lasting for a duration of 100 ms was detected as the line disconnect signal due to which her calls were frequently being disconnected in the middle of her conversation.

The advantages of in band signalling:

→ The Control signals can be sent to every part where a speech signal can reach.

→ The Control signals will be independent of the transmission systems

Scanned by TapScanner

as they are carried along with the speech signals.

Answer to the question no: 2(c)

Private branch exchange: Private branch exchange or PBX can be understood as a local exchange within an office or a building. In order to communicate within themselves. As the name implies, it is a private exchange, which is a branch to the main exchange similar to a local loop

Scanned by TapScanner

Connected to the main loop as a branch. Private branch exchange is a telephone system within a local area that switches calls between those users on local lines while allowing all users to share a certain number of external phone ~~cal~~ lines. The main purpose of PBX is to save the cost of requirement for a line to each user to the central exchange office.

Scanned by TapScanner

Answer to the question no: 3(a)

ISDN: ISDN stands for Integrated services of digital networking. This is a circuit switched telephone network system, which also provides access to packet switched networks.

ISDN supports a variety of services. such as

→ voice Calls
→ ~~fasci~~ facsimile.
→ videotext
→ Teletext
→ Electronic mail
→ Database access

Scanned by TapScanner

→ Data transmission and voice
→ Connection to internet
→ Electronic fund transfer
→ Image and graphics exchange.
→ Document storage and transfer
→ Audio and video conferencing.

Answer to the question no: 3(b)

There are some advantages and disadvantages of ISDN.

Advantages:

→ Facilitate the user with multiple digital channels. these channels can operate concurrently through the

Scanned by TapScanner

same one copper wire pair.

→ The digital signals broadcasting transeversely the telephone lines.

→ ISDN provides high data rate because of digital scheme which is 56 kbps.

→ ISDN takes only 2 seconds to launch a connection while other modems take 30 to 60 seconds for establishment.

Disadvantages:

→ It is very costly than the other typical telephone system.

→ ISDN requires specilized digital devices just like telephone company.

Scanned by TapScanner

Answer to the question no: 3(c)

The primary rate interface or primary Rate access, simply called the ISDN PRI Connection is used by enterprises and offices. The pri Configuration is based on T-Carrier or T_1 in the US, Canada and Japan Countries Consisting of 23 data or bearer Channels and one Control or delta Channel, with 64 Kbps speed for a band width of 1.544 M bits/sec. The pri Configuration is based on

Scanned by TapScanner

E Carrier or E1 in Europe, Australia and few asian Countries Consisting of 30 data or bearer Channels and two Control or delta Channel with 64 Kbps speed for a bandwidth of 2.048 Mbits/sec.

Answer to the question no: 04(a)

Wireless transmission was originally Shown as a method to remain in Continuous Contact with Ships. In 1946, FM Consumer mobile phone Systems were introduced.

Scanned by TapScanner

A group of frequencies allocated to a large geographic zone. When moving to a new zone, Calls had to be re'initiated. 120 KHz per Channel due to poor filter technology. Half duplex system which is only one person Could speak at a time. Most users not Connected to PSTN. Later progressed to GMTS. 30 KHz Channels in the 450 MHz range. Only 12 Channels in NYC in 1976.

Scanned by TapScanner

Answer to the question no: 04(b)

A geographic area can be divided into several hexagonal areas, or cells, with an transmitter located in the centre of each cell.

Allows for frequency reuse as two cells in the same geographic area can use the same frequency. Increases the spectral efficiency of the system, but increases infrastructure expense. Technology to implement cellular telephony

Scanned by TapScanner

was available only in the late 1970's. Base station provides access between mobile users and the mobile switching Centre.

Answer to the question no: 04(c)

Frequency reuse patterns: Reuse allows a small set of frequencies, K to service a large area (numbers reffer to transmitters with same frequencies). Reuse patterns are designed to minimize co-channel interference.

Scanned by TapScanner

Interference from other base stations using the same frequency. A larger reuse pattern results in a larger distance between base stations that use the same frequency.

$$D = \sqrt{3KR}$$

Answer to the question no: 05(a)

We define the co-channel interference reduction factor by

$$q = \frac{D}{R} = \sqrt{3K}$$

Scanned by TapScanner

Answer to the question no:05(a)

Co Channel interference reduction: We define the Co channel interference reduction factor by

$$q = \frac{D}{R} = \sqrt{3K}$$

Here the radius R, is the distance from the centre of the cell to an outer corner. The distance D, is the distince from one transmitter to the next transmitter of the same frequency. In most cases only the first tier of interfering cells are considered.

Scanned by TapScanner

Co Channel interference disturbs the spectral efficiency in cellular radio systems. A Co Channel interference reduction method using a Constant modulus algorithm adaptive array antenna is proposed.

Answer to the question no: 05(b)

Free space path loss: In telecommunicatio the free space path loss is the attenuation of radio energy between the feedpoints of two antennas that results from the Combination

Scanned by TapScanner

of the receiving antenna's capture area plus the obstacle free, line of sight path through free space.

The free space path loss formula derives from the friis transmission formula. This states that in a radio system consisting of a transmitting antenna transmitting radio waves to a receiving antenna, the ratio of radio wave power received P_r to the power transmitted P_t is

Scanned by TapScanner

$$\frac{P_r}{P_t} = D_t D_r \left(\frac{\lambda}{4\pi d}\right)^2$$

Where,

D_t = Directivity of transmitting antenna

D_r = Directivity of the receiving antenna

λ = signal wavelength.

d = distance between the antennas.

Answer to the question no: 5 (c)

A Convenient way to express free space path loss in terms of decibels.

$$\text{Free space path loss} = 10\log_{10}\left(\left(\frac{4\pi d f}{c}\right)^2\right)$$

$$= 20\log_{10}\left(\frac{4\pi d f}{c}\right)$$

Scanned by TapScanner

$$= 20 \log_{10}(d) + 20 \log_{10}(f) + 20 \log_{10}\left(\frac{4\pi}{c}\right)$$

$$= 20 \log_{10}(d) + 20 \log_{10}(f) - 147.55$$

where the units are as before

for typical radio applications, it is common to find f measured in units of GHz and d in km, in which case the FSPL equation becomes

Free space path loss (dB) $= 20 \log_{10}(d) + 20 \log_{10}(f) + 92.45$.

Scanned by TapScanner

Answer to the question no: 6(a)

Carrier to interference ratio:

The Carrier to interferen ce ratio, c/I of the signal at the mobile from the transmitter in a given cell, Can be found in an approximate manner by summation of interference from all base stations using the Same frequency. usually expressed in dB.

$$\frac{C}{I} = \frac{R^{-n}}{\sum_{i=1}^{M} D_i^{-n}}$$

Scanned by TapScanner

If we assume all base stations are identically spaced, and are at the centres of their cells, we have the C/I approximation of:

$$\frac{C}{I} = \frac{(\sqrt{3k})^n}{M}.$$

Answer to the question no: 06(b)

Fading: During transmission from the base station to the mobile, the received power fluctuates. We can generalize the factors that affact the received power level into 3 main groups.

Scanned by TapScanner

→ Path loss: Changes only with distance from transmitter. There are also losses associated with the frequency of transmission, size.

→ Long term fading or shadowing: Caused by buildings or tunnels 'shadowing' transmission from BS. Changes with mobile position.

→ Short term fading: Due to multiple paths of transmission arriving at the mobile at the same time. If there are other paths that arrive with some delay, it is called multi path fading.

Scanned by TapScanner

Answer to the question no: 06(c)

following points summerize difference between flat fading and frequency selective fading:

→ In flat fading, Bandwidth of signal is less than the Bandwidth of Channel where as in frequency selective fading Bandwidth of signal is greater than the bandwidth of Channel.

→ In flat fading, delay spread is less than symbol period where as in frequency selective fading, delay spread is greater than symbol period.

Scanned by TapScanner

→ In flat fading, range of frequencies in a frequency spectrum are equally faded unlike in frequency selective fading where in one part of frequency spectrum is faded more than the other part of frequency spectrum.

Answer to the question no: 07(a)

Registration: Registration is the process of notifying the network that a phone is active on the system. When a phone is switched on,

Scanned by TapScanner

it registers by signalling to the MSC via the base station on a set up on Control Channel.

There are two types of Registration.

① periodic registration: periodic registration is when the phone announces itself on a regular basis.

② forced registration: forced registration is when the phone monitors a control Channel which provides information including the cell identification. If the channel strength fades below a threshold, the phone selects another channel.

Scanned by TapScanner

Answer to the question no: 07(b)

Roaming: Roaming is when a phone is outside its home area or local region. If the phone registers outside its home area, the MSC contacts the phone's home area and confirms that the phone is OK.

Call initiated from PSTN:

→ MSC receives call from PSTN, sends requested MIN to all BS's.

→ BS transmits page for user.

→ Mobile receives, and confirms

Scanned by TapScanner

MIN match with ESN.

→ BS relays info to MSC.

→ MSC verifies ESN/ MIN pair.

→ MSC tell BS to select used voice Channel pair; BS selects voice Channel pair and informs mobile to move to those channels.

Answer to the question no: 07(c)

Multipath fading: It occurs when a signal reaches the receiver from various path. When multipath propagation takes place. Multipath fading can affect all ranges of frequencies

Scanned by TapScanner

starting from low frequency to microwave and beyond. It affects both the amplitude and the phase of the signal causing phase distortions and ISI. Multipath fading can affect signal transmission in two ways.

→ Flat fading: In flat fading, all frequency components get affected almost equally.

→ Selective fading: selective fading refers to multipath fading when the selective frequency component

Scanned by TapScanner

of the signal is affected.

Answer to the question no: 08 (a)

FDMA: FDMA stands for frequency division multiple access. It is one of the most common analog multiple access methods. It is allocated for wireless cellular telephone communication into 30 channels.

Advantages of FDMA:

→ Reduces the bit rate information and the use of efficient numerical codes increases the capacity.

Scanned by TapScanner

→ It reduces the cost and lowers the inter symbol interference.

→ Equalization is not necessary.

→ Since the transmission is continues less number of bits are required for synchronization and framing.

Answer to the question no: 08 (b)

CDMA: CDMA stands for code division multiple access. It refers to any of several protocols used in second generation and third generation wireless communication.

Scanned by TapScanner

Mobile switching center: A mobile switching center is the centerpiece of a network switching subsystem, The MSC is mostly associated with communication switching functions, such as call set up, release, and routing. However, it also performs a host of other duties, including routing SMS messages, conference calls fax and service billing as well as interfacing with other networks such as public switched telephone network.

Scanned by TapScanner

Answer to the question no: 08(c)

	GSM	CDMA
1. Full form	1. Global system for mobile Communication	1. Code division multiple access.
Technology used	2. FDMA and TDMA	2. CDMA
Availability	3. GSM is globally widely used and available.	3. CDMA is available in fewer Countries and Carriers.
Data speed rate	4. 42 Mbps in HSPA(3G)	4. 3.6 Mbps in CDMA.
Features	5. GSM supports transmitting data and voice both at once.	5. CDMA does not support this feature.

Scanned by TapScanner