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1. a) What is Telecommunication? Briefly discuss about it. (2+2)

b) What are the major systems of telecommunication network? (3)

(c) Briefly describe about switching hierchy and routing? (3)

(d) What do you mean by Hierchical topology? (4)

2. a) What is fiber optics? How does fiber-optics works? (2+2)

(b) What is the fiber optical lines map? How it works? (2+2)

c) What are the uses of fiber optics? (5)

3. a) What do you mean by machine to machine communication? (4)

b) Briefly describe the history of telecommunication? (5)

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4. a) What do you mean by GSM? Why does we use it? (2+5)

b) Describe the term CDMA. What are the network overview of CDMA? (2+5)

5. a) What is the advantages of cellular System? (7)

b) What is Fading? What are the different types of Fading? (1+6)

6. a) Which are the components of telecommunication network? (7)

b) Describe about Internet. What are the applications of communication and computer network? (2+5)

7. a) What are the transmission systems? (3)

b) What are the Long distance radio communication categories? (4)

c) What do you mean by In-band signaling? (4)

4) What is out-band signaling? (3)

8. a) Explain buffuring? (3)

b) Do you know how does trace route work? (2)

c) What is Broadband? Describe it. (1+2)

d) Explain functional concept of GSM and CDMA (6)

Answer to the question no: 1(a)

Q: What is Telecommunication? Briefly describe about it. (4)

Answer:

Telecommunication, or telecom, refers to the process of exchanging information such as voice, data and video transmissions via electronic technologies like telephones, microwave communications, fiber optics, satellites, radio and television broadcasting and the internet.

A telecommunication circuit means that there is a minimum of two stations, each equipped with a transmitter and a receiver. Depending on the type of telecom technology used, the method of transmitting information accross the circuit could be electrical wire/cable, optical fiber or wireless.

Answer to the question no: 1(b)

Q: What are the major systems of telecommunication network? (3)

Answer:

They are,

(i) Subscribers instruments or equipments,
(ii) Subscriber Loop systems,
(iii) Switching systems,
(iv) Transmission systems,
(v) Signalling systems.

Answer to the question no: 1(c)

Q: Briefly describe about switching Hierchy and Routing? (3)

Answer:

The next important system that rule the world is the switching hierchy and routing

of the telephone lines. The interconnectivity of calls between different areas having different exchanges is done with the help of trunk lines between the exchanges. The group of trunk lines that are used to interconnect different exchanges are called the Trunk Groups.

In the process of interconnecting exchanges, there are three basic topologies, such as

(i) Mesh Topology.
(ii) Star Topology,
(iii) Hierarchical

Answer to the question no: 1(d)

Q: What do you mean by Hierarchical Topology? (4)

Answer:

Hierarchical Topology:

The Hierarchical topology is used to handle heavy traffic with minimal

number of trunk groups. The traffic flows through the Final route which is the highest Level of hierarchy. If the traffic intencity between any pair of exchanges is high, direct trunk routes may be established between them as indicated by dashed lines. ~~in the~~ These direct trunk routes are High Usage routes. Wherever these high usage routes exist, the traffic flows through them. Here, the overflown traffic is routed along the hierarchical path. No overflow traffic is permitted from the final route.

Answer to the question no: 2(a)

Q: What is fiber optics? How does fiber-optics works? (4)

Answer:

Fiber-optics:

We are used to the idea of information travelling in different ways. When we speak into a landline telephone, a wire cable carries the sounds from our voice into a socket in the wall, where another cable takes it to the local telephone exchange. Fiber works in a special way. it sends information coded in a beam of light down a glass of plastic pipe. It was originally developed for endoscopes in the 1950s to help doctors see inside the human body without having to cut it open first.

How fiber-optics works:

Light travels down a fiber optic cable by bouncing repeatedly off the walls. Each tiny photon bounces down the pipe like a bobsleigh going down a ice run. Now you might expect a beam of light, traveling in a clear glass pipe, simply to leak out of the edges. But if light hits glass at a really shallow angle it reflects back in again — as through the glass were really a mirror. This phenomenon is called total internal reflection. It's one of the things that keeps light inside the pipe. The other thing that keeps light in the pipe is the structure of the cable, which is made up of two separate parts.

Answer the to the question no. 2(b)

Q: What is the fiber optical lines map? How it works? (4)

Answer: Fiber optical lines map:

Our planet has a hidden fiber optical lines map that links the world wide web and makes everything we use the internet for possible. For decades, long-distance communication efforts relied on travelling via electrical cables. The data transmission would take a long time and would result in missing power and data untill the late 20th century.

How it works:

In 1960 Dr. Charles Kao, the father of optics, discovered certain physical properties of glass. The traveling of light compared to radio signals and electrical signals allows for extremly less power and

data to be lost, making fiber optical signals superior. The information traveling within optical fiber does not degrade much over great distances and allows for more efficient communication.

Answer to the question no: 2(c)

Q: What are the uses of fiber optics? (6)

Answer:

Shooting light down a pipe seems li a neat scientific trick in practical applications for something like electrical cab The uses are,

(i) Computer networks:

Fiber optic cables are now the main way of carrying information over long distances they have three big advantage over old-style copper cables:

⇒ Less attenuation,

⇒ No interference, and

⇒ Higher bandwidth

(ii) Broadcasting:

As more and more people connected to cable and the networks started to offer greater choice of channels and program, cabl operators found they needed to switch from coaxial cables to optical fibers and from analog to digital broadcasting.

(iii) Medicine:

Medicine gadgets that could help doctors peer inside our bodies cutting ther open were the first proper application of fiber optics over a half century ago. Today ag gastroscopes are just as important as eve

but fiber optics continues to spawn new forms of medical scanning and diagnosis.

(iv) military:

Fiber optics cables are inexpensive, thin, lightweight, high-capacity, robust against attack and extremly secure, so ~~military~~ they offer perfect ways to connect military bases and other installations, such as missile launch sites and radar tracking stations. Since they don't carry electrical signals, they don't give off electromagnetic radiation that an enemy can detect, and they are robust against electromagnetic interference. Another benefit is they relatively light weight of fiber cables compared to traditional wires made of cumbersome and expensive copper metal.

Answer to the question no: 3(a)

Q: What do you mean by machine to machine communication? (4)

Answer:

The machine to machine concept represents any technology that allows two devices to exchange information with each other, for example, communicate and send data. The communication that occurs between the machines or devices is autonomous, there is no need for human intervention for this data exchange to take place.

Types of Connectivity:

There are different types of connectivity between machines. We have RFID, or radiofrequency identification. The limitation of this type of connectivity is that it has a maximum range of 10 meters. On the other

hand, there are bluetooth and wifi that also have a limited range from 10-20m. These types of connectivity are short range if we compare them with others. Connectivity using low frequency has a range of up to 1,000 km and the GSM network or the satellite is worldwide.

Answer to the question no: 3(b)

Q: Briefly describe the history of telecommunication? (5)

Answer:

The history of telecommunication began with the use of smoke signals and drums in africa, the Americas and parts of Asia. In the 1790s, the first fixed semaphore systems emerged

in Europe. However, it was not until the 1850s that electrical telecommunication systems started to appear.

Early Era of Telecom:

In 1792, a French engineer, Claude Chappe built the first visual telegraphy system between Lille and Paris. This was followed by a line from Strasbourg to Paris.

Birth of telegraph System:

Telecom began with the successful innovation of Samuel Morse's telegraph system in 1844. For three year, the U.S. post office ran pioneering Washington to Baltimore line.

Birth of Telephone:

The success of telegraph industry and rising electrical manufacturing

businesses formed the context for the telephone. The electric telephone was invented in the 1870s, based on earlier work with harmonic telegraphs.

Coaxial Cable and Microwave links:

Improve technology would began to change face of telecommunicati after 1945. Paced by wartime needs and spending, Bell labs and other researche produced coaxial cable and microwave li that were first used commercially in the years after war.

Satellite Communications:

Development of satellite was first hinted at in a 1945 article where a geostationary orbit 22,300 mile high that would keep a satellite above the same part of Earth.

Answer to the question no: 3(c)

Q: What are the future applications of Telecommunication? (5)

Answer:

As we prepare to enter the next decade, telecoms are being transformed by technology in a variety of ways.

(i) 5G:

5G promises some dramatic changes. The European Union's 5G action plan includes uninterrupted 5G coverage by 2025 for railways and major roads.

(ii) Artificial Intelligence:

through virtual assistants and chatbots, and the AI that runs these tools behind the scenes, telecom companies improve customer service and satisfaction.

(iii) Internet of Things:

Because the telecom industry enables internet device connectivity it is one of the largest players in the Internet of Things market, everyday items that are connected to one another and the internet.

(iv) Big data:

It is undeniable that telecommunication companies are collecting and generating volumes of data from mobile devices and apps, wearable and more wireless data is expected to continue to increase through 20.

(v) Robotic Process Automation:

Robotics can take over repetitive, rules-based, high-frequency processes and complete them very accurately.

Answer to the question no: 4(a)

Q: What do you mean by GSM? Why can we use it? (7)

Answer:

GSM:

GSM stands for Global System for Mobile Communication. It is a digital cellular technology used for transmitting mobile voice and data services.

The concept of GSM emerged from a cell-based mobile radio system at Bell Laboratories in the early 1970s. GSM makes use of narrowband Time Division Multiple Access (TDMA) technique for transmitting signals. It was developed using digital technology. It has an ability to carry 64kbps to 120 Mbps of data rate.

Why we use GSM:

Listed below are the features of GSM that account for its popularity and wide acceptance,

→ improved spectrum efficiency,

→ International roaming,

→ Low-cost mobile sets and base station

→ High quality speech

→ Compatibility with integrated services Digital Network and other telephone company services

→ Support for new services.

Answer to the question no 4(b)

Q: Describe the term CDMA. What are the network overview of CDMA? (7)

Answer:

Code Division Multiple Access is a channel access method normally used by 3G radio communication technology as well as in some other technologies. The technicality of CDMA technology has given significant advantages over other parallel technologies in terms of spectrum effiecieney and overall performance.

CDMA Network Overview:

A base station is an essential element of the CDMA network. A base station covers a small geographical area called a cell. A cell may be omnidirec

or sectoral. Each base station has a transmitting antenna and two receiving antennas for each cell. Two receiving antennas are used per cell for the purpose of spatial diversity. In many applications, it is a Base station Controller, which controls several base stations.

Answer to the question no: 5(a)

Q: What is the advance of Cellular system? (7)

Answer:

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 expenses.

=) technology to implement cellular telephony 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: 5(b)

Q: What is Fading? What are the different types of Fading? (7)

Answer:

Fading:

In wireless communication fading refers to the attenuation of the transmitted signal power due to various variables during wireless propagation. These variables can be atmospheric conditions such as rainfall and lightning, geographical position, time, radio frequency etc.

Transmitted signals encounter multiple reflectors in the environment during its propagation before reaching the receiver.

Types of Fading:

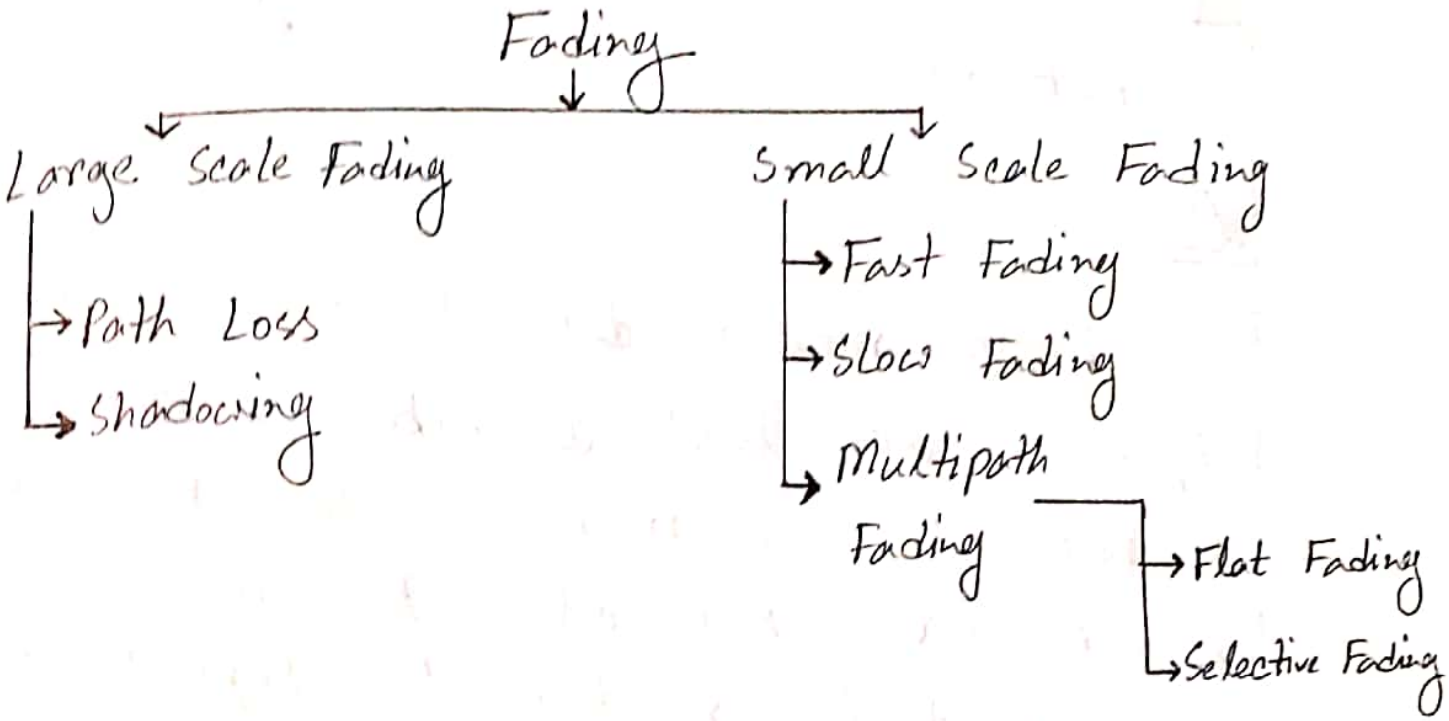

Fig: Types of fading

Answer to the question no: 6(a)

Q: Which are the components of telecommunication network? (7)

Answer:

Most modern day telecommunication systems are best described in terms of a network. This includes the basic elements listed above but also the infrastructure and controls needed to support the system. The components are,

(i) Input and Output device:

These provide the starting and stopping points of all communication. A telephone is an example of a terminal.

(ii) Channels:

Which transmit and receive data. This includes various types of cables and wireless radio frequencies.

(iii) Processors: Gto-

which provide a number of control and support functions

(iv) Control software:

It is responsible for controlling the functionality and activities of the network.

(v) Message:

Messages represent the actual data that is being transmitted.

(vi) Protocols:

Protocols specify how each type of telecommunication systems handle the messages.

Answer to the question no: 6(b)

Q: Describe about Internet. What are the applications of Communication and computer Network? (2+5)

Answer:

Internet:

A network of networks is called an internetwork, or simply the internet It is the largest network in existence on this planet. The internet hugely connects all WANs and it can have connection to LANs and Home Networks. Internet uses ICP/IP protocol suite and uses IP as its addressing protocol. Present day, internet is cridely implemented using IPv4. Because of shortage of address spaces, it is gradually migrating from IPv4 to IPv6.

Applications of Communication:

Computer systems and peripherals are connected to from a network. They provide,

(i) Resource sharing such as printers,
(ii) Exchange of information by means of e-Mails
(iii) Information sharing by using internet,
(iv) Interaction with other users, using dynamic web pages,
(v) IP phones,
(vi) Video conferences,
(vii) Parallel computing, and
(viii) Instant messaging.

Answer to the question no: 7(a)

Q: What are the transmission systems? (3)

Answer:

Modern long distance transmission systems can be placed under the broad categories.

⇒ Radio Systems,

⇒ Co-axial cable systems, and

⇒ Optical fibre systems.

Answer to the question no: 7(b)

Q: What are the long distance radio communication categories? (4)

Answer:

Depending on the mechanism of

propagation, Long distance radio communicati
can be placed under four categories.

(i) Sky wave or ionosphere communication,
(ii) Line-of-sight microwave communicatio
limited by horizon,
(iii) Tropospheric scatter communication,
(iv) Satellite communication,

Answer to the question no: 7(c)

Q: What do you mean by In-band Signaling? (4)

Answer:

In-band Signaling:

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

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

Answer to the question no: 7(d)

Q: What is Out-band Signaling? (3)

Answer:

Out-band Signaling:

The of out-band signaling uses frequencies which are above the voice band but below the upper limit of 4000 Hz of the nominal voice channel

signaling. The signaling is done throughout the speech period and thus continuous supervision of the call is allowed. Extra circuits are needed to handle the extremly narrow band width of this signaling, due to which it is seldom use

Answer to the question no: 8(a)

(3)

Q: Explain Buffering?

Answer:

Buffering is a method of overlapping the computation of a job with its execution. It temporarily stores input or output data in an attempt to bet match the speeds of two devices such as a fast CPU and a slow disk drive. If, for example, the CPU writes information to the buffer, it can continu

in its computation while the disk drive stores the information.

Answer to the question no: 8(b)

Q: Do you know how does the traceroute work? (2)

Answer:

Trace route finds out when the packet has reached the destination point by including a port number that is outside of the normal range. When it is received, a port unreachable message is returned, enabling trace route to determine the time length of the final hop.

Answer to the question no: 8(c)

Q: What is broadband? Describe it. (3)

Answer:

Broadband is an internet access with high speed.

→ Unlike dial-up connection, broadband connection is permanently connected.

→ It allows internet and telephone calls to take place simultaneously. No need land line is required.

→ Modulation is done in broadband on signals to transform data better.

Answer to the question no: 8(d)

Q: Explain Functional Concept of GSM and CDMA? (c)

Answer:

GSM / CDMA:

(i) Cell and Sector with multiple frequency. CDMA single frequency as carrier,

(ii) used TDMA and FDMA for accessing. CDMA uses CDMA method,

(iii) GSM is initial 2G technology with initial voice rate of 9.6kbps. CDMA voice rate is 14.4kbps,

(iv) GSM emerges into WCDMA. CDMA emerges into cdma 2000,

(v) Power control in access method is comparatively not efficient. CDMA as phase locked Loops for power transmission is better,

(vi) Call hand off and network hand off is not smoother is GSM. CDMA follows soft handoffs and handling call hence more efficient,

(vii) GSM use less bandwidth and more power comparitively. CDMA uses less bandwidth and more power, and

(viii) Cost wise for operator GSM is less costier, but efficiency wise CDMA is better.