MOBILE COMPUTING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (UG & PG)

Third Year Computer Science and Engineering, 6th Semester

Subject Code & Name: MOBILE COMPUTING

UNIT-I
WIRELESS COMMUNICATION FUNDAMENTALS

1. What is mobile computing?

Mobile computing is a technology that allows transmission of data, via a computer, without having to be connected to a fixed physical link.

2. What are two different kinds of mobility?

User Mobility: It refers to a user who has access to the same or similar telecommunication services at different places.

Device Portability: many mechanisms in the network and inside the device have to make sure that communication is still possible while the device is moving.

3. Find out the characteristics while device can thus exhibit during communication.

- Fixed and Wired
- Mobile and Wired
- Fixed and Wireless
- Mobile and Wireless

4. What are applications of Mobile Computing?

- Vehicles
- Emergencies
- Business
- Replacement of wired networks
- Infotainment
- Location dependent services
    - Follow-on services
    - Location aware services
    - Privacy

  - Information services
  - Support services
- Mobile and wireless devices
  - Sensor
  - Embedded controllers
  - Pager
  - Mobile phones
  - Personal digital assistant
  - Pocket computer
  - Notebook/laptop

5. What are the obstacles in mobile communications?

- Interference
- Regulations and spectrum
- Low Bandwidth
- High delays, large delay variation
- Lower security, simpler to attack
- Shared Medium
- Adhoc-networks.

6. What is TETRA?

TETRA (Terrestrial Trunked Radio) systems use different radio carrier frequencies, but they assign a specific carrier frequency for a short period of time according to demand. TETRA's are highly reliable and extremely cheap.

7. Which elements of the network perform the data transfer?

Physical medium

8. Compare the different types of transmission errors that can occur in wireless and wired networks.

Types of Error:

- Data loss
- Noise
- Low power

9. Define Signal.

A signal is defined as any physical quantity carrying information that varies with time. The value of signal may be real or complex. The types of signal are continuous signal and discrete time signal.

10. Define antenna.

An antenna or aerial is one or more electrical conductors of a specific length that radiate radio waves generated by a transmitter or that collect radio waves at the receiver.

11. State the relation between wavelength and frequency.

Wavelength is the length or distance of one cycle of an ac wave. It is also the distance that an ac wave travels in the time required for one cycle of that signal. Wavelength is expressed as the ratio of the speed of light to the frequency of the signal

12. What are the main problems of signal propagation?

Power additionally influenced by

- fading (frequency dependent)
- shadowing
- Reflection at large obstacles
- Refraction depending on the density of a medium
- scattering at small obstacles
- Diffraction at edges

13. How a receiver adopts for Multi-path propagation effects during wireless reception?

Time dispersion: signal is dispersed over time Interference with .neighbor. Symbols, Inter Symbol Interference (ISI),The signal reaches a receiver directly and phase shifted distorted signal depending on the phases of the different parts.

14. What is multipath propagation?

Multipath propagation is the direct from a sender to a receiver the propagation effects mentioned in the previous section lead to one of the most severe radio channel impairments.

15. What are the types of Frequency Modulation?

Based on the modulation index FM can be divided into types. They are Narrow band FM and Wide band FM. If the modulation index is greater than one then it is wide band FM and if the modulation index is less than one then it is Narrow band FM.

16. What is the basic difference between an AM signal and a narrowband FM signal?

In the case of sinusoidal modulation, the basic difference between an AM signal and a narrowband FM signal is that the algebraic sign of the lower side frequency in the narrow band FM is reversed.

17. How will you generate message from frequency-modulated signals?

First the frequency-modulated signals are converted into corresponding amplitude-modulated signal using frequency dependent circuits.Then the original signal is recovered from this AM signal.

18. What is called multipath Interference?

The interference caused by the interfacing of the signal form the indirect path with the signal of direct path is called multipath interference.

19. Define reflection loss

Reflection loss is defined as the number of nippers or decibels by which the current in the load under image matched conditions would exceed the current actually flowing in the load

20. Define multiplexing.

Multiplexing is defined as the process of transmitting several message signals simultaneously over a single channel.

21. List out the various Multiplexing Schemes?

- Space division multiplexing
- Frequency division multiplexing
- Time division multiplexing
- Code division multiplexing

22. Give the use of SDMA./ What is SDMA?

Space Division Multiple Access (SDMA) is used for allocating separated spaces to users in wireless networks. The basis for the SDMA algorithm is formed by cells and sectorized antennas which constitute the infrastructure implementing space division multiplexing (SDM).

23. Define CDMA.

Code Division Multiple Access systems use codes with certain characteristics to separate different users. To enable access to the shared medium without interference. The users use the same frequency and time to transmit data. The main problem is to find good codes and to separate this signal from noise. The good code can be found the following 2 characteristic

1. Orthogonal.
2. Auto Correlation.

24. What the features are of Code Division multiple Accesses?

- It does not require external synchronization networks.
- CDMA offers gradual degradation in performance when the no. of users is increased But it is easy to add new user to the system.
- If offers an external interference rejection capability.

25. How are guard spaces realized between users in CDMA?

The guard space between a pair of users in CDMA systems is the orthogonality between their spreading codes. The lower the correlation between any pair of spreading codes is, the better is the user separation.

26. What is hopping sequence?

Transmitter and receiver stay on one of the channels like and TDM. The pattern of channel usage is called the hopping sequence,

27. What is the need for modulation?

Needs for modulation:

- Ease of transmission
- Multiplexing
- Reduced noise
- Narrow bandwidth
- Frequency assignment
- Reduce the equipments limitations.

28. Give the classification of modulation.

There are two types of modulation. They are

- Analog modulation
- Digital modulation

29. Give the classification of Digital modulation.

- Amplitude shift keying
- Phase shift keying
- Frequency shift keying

30. Define demodulation.

Demodulation or detection is the process by which modulating voltage is recovered from the modulated signal. It is the reverse process of modulation.

31. Define stability.

It is the ability of the receiver to deliver a constant amount of output for a given a given period of time.

32. What are the 3 different basic schemes analog modulations?

1. Amplitude modulation
2. Frequency modulation
3. Phase modulation

33. Define frequency modulation.

Frequency modulation is defined as the process by which the frequency of the carrier wave is varied in accordance with the instantaneous amplitude of the modulating or message signal.

34. Define phase modulation.

Phase modulation is defined as the process of changing the phase of the carrier signal in accordance with the instantaneous amplitude of the message signal.

35. What is the advantage of a spread spectrum technique?

The main advantage of spread spectrum technique is its ability to reject interference whether it be the unintentional interference of another user simultaneously attempting to transmit through the channel (or) the intentional interference of a hostile transmitter to jam the transmission.

36. What is called frequency hop spread spectrum?

In frequency hop spread spectrum, the frequency of the carrier hops randomly from one frequency to another frequency.

37. What is the function of Medium Access Control Layer?

The functions of Medium Access Control Layer are responsible for establishes, maintains, and releases channels for higher layers by activating and deactivating physical channels.

38. What are the several versions in CSMA?

There are several versions in CSMA, they are as follows

a) Non-persistent CSMA
b) p-persistent CSMA
c) 1-persistent CSMA

39. What is meant by non-persistent CSMA?

In, non-persistent CSMA, stations sense the carrier and start sending immediately if the medium is idle, if the medium is busy, the station pauses a random amount of time before sensing the medium again and repeating this pattern.

40. What is meant by p-persistent CSMA?

In p-persistent CSMA system nodes also sense the medium, but only transmit with a probability of p. With the station deferring to the next slot with the probability1-p, i.e. access is slotted in addition.

41. What is FDD?

In FDMA, the base station and the mobile station establish a duplex channel. The two directions, mobile station to base station and vice versa are separated using different frequencies. This Scheme is called Frequency Division Duplex (FDD)

42. What is dwell time?

The time spend on a channel with a certain frequency is called the dwell time

43. What is fast frequency hopping?

If the hop rate is an integer multiple of symbol rate (multiple hops per symbol) then it is called fast frequency hopping.

44. What is slow frequency hopping?

If the symbol rate of MFSK is an integer multiple of hop rate (multiple symbols per hop) then it is called slow frequency hopping.

45. What is a burst error?

A burst error is when two or more consecutive bits within a given data string are in error. These errors can affect one or more characters within a message.

46. What are the 2 sub layers in DLC?

- Logical Link Control(LLC)
- Media Access Control(MAC)

47. Define traffic multiframe and control multiframe?

1. The periodic pattern of 26 slots occurs in all TDMA frames with a TCH.
2. The combination of these frames is called traffic multiframe
3. TDMA frames containing data for the other logical channels are combined to a control multiframe.

48. Explain about transparent mode?

The transparent mode transfer simply forwards MAC data without any further processing. The system then has to rely on the FEC which is always used in the radio layer.

49. List out the advantage of cellular wireless networks.

- Higher capacity, higher number of users
- Less transmission power needed
- More robust, decentralized
- Base station deals with interference, transmission area etc.

UNIT II TELECOMMUNICATION NETWORKS

1. What are the disadvantages of cellular systems?

The advantages of cellular systems are,

- Infrastructure needed
- Hand over needed
- Frequency planning

2. What are the basic groups of logical channels?

GSM specifies 2 basic groups of logical channels,

- Traffic channels
- Control channels

3. What are the categories of Mobile services?

- Bearer services
- Tele services
- Supplementary services

4. What are subsystems in GSM system?

- Radio subsystem (RSS)
- Network & Switching subsystem (NSS)
- Operation subsystem (OSS)

5. What are the control channel groups in GSM?

The control channel groups in GSM are:

- Broadcast control channel (BCCH)
- Common control channel (CCCH)
- Dedicated control channel (DCCH)

6. What are the four types of handover available in GSM?

1. Intra cell Handover
2. Inter cell Intra BSC Handover
3. Inter BSC Intra MSC handover
4. Inter MSC Handover

7. Give the information's in SIM?

- card type, serial no, list of subscribed services
- Personal Identity Number(PIN)
- Pin Unlocking Key(PUK)
- An Authentication Key(KI)

8. What is the frequency range of uplink and downlink in GSM network?

- The frequency range of uplink in GSM network is 890-960 MHz
- The frequency range of downlink in GSM network is 935-960 MHz

9. What are the security services offered by GSM?

The security services offered by GSM are:

- Access control and authentication.
- Confidentiality.
- Anonymity.

10. What are the control channel groups in GSM?

The control channel groups in GSM are:

- Broadcast control channel (BCCH).
- Common control channel (CCCH).
- Dedicated control channel (DCCH).

11. What is authentication centre (AuC)?

As the radio interface and mobile stations are particularly vulnerable a separate AuC has been defined to protect user identity and data transmission. The AuC contains the algorithms for authentication as well as the keys for encryption and generates the values needed for user authentication in the HLR. The AuC may, in fact, be situated in a special protected part of the HLR.

12. What is Network and Switching subsystem?

The heart of the GSM is formed by the Network and Switching System (NSS). NSS consists of the following switches and databases:

- Mobile Services switching Center (MSC)
- Home Location register (HLR)
- Visitor Location Register (VLR)

13. What are the services provided by supplementary services?

- User identification
- Call redirection
- Call forwarding
- Closed user groups
- Multiparty Communication

14. What are types of Handover?

- Intra-cell handover
- Inter-cell, intra- BSC handover
- Inter-BSC, intra-MSC handover
- Inter MSC handover

15. What are the reasons for delays in GSM for packet data traffic?

Collisions only are possible in GSM with a connection establishment. A slotted ALOHA mechanism is used to get access to the control channel by which the base station is told about the connection establishment attempt. After connection establishment, a designated channel is installed for the transmission.

16. If 8 speech channels are supported on a single radio channel, and if no guard band is assumed, what is the number of simultaneous users that can be accommodated in GSM?

1000 users.

17. What is meant by beacon?

A beacon contains a timestamp and other management information used for power management and roaming. e.g., identification of the base station subsystem (BSS)

18. List out the numbers needed to locate an MS and to address the MS.

The numbers needed to locate an MS and to address the MS are:

- Mobile station international ISDN number (MSISDN)
- International mobile subscriber identity (IMSI)
- Temporary mobile subscriber identity (TMSI)
- Mobile station roaming number (MSRN)

19. What is meant by GPRS?

The General Packet Radio Service provides packet mode transfer for applications that exhibit traffic patterns such as frequent transmission of small volumes.

20. What is meant by GGSN?

GGSN is Gateway GPRS Support Node. It is the inter-working unit between the GPRS network and external packet data networks. The GGSN is connected to external networks via the Gi interface and transfers packets to the SGSN via an IP-based GPRS backbone network.

21. What is meant by SGSN?

SGSN is Serving GPRS Support Node. It supports the MS via the Gb interface. The GSN is connected to a BSC via frame relay.

22. What is meant by BSSGP?

BSSGP is Base Station Subsystem GPRS Protocol. It is used to convey routing and QoS- related information between the BSS and SGSN.BSSGP does not perform error correction and works on top of a frame relay network.

23. Define the protocol architecture of DECT.

The protocol architecture of DECT consists of three layers. They are:

1. Physical Layer.
2. Medium Access Layer.
3. Data Link Control Layer.
4. Network Layer.

24. What are the steps perform during the search for a cell after power on?

The steps perform during the search for a cell after power on is:

- Primary Synchronization.
- Secondary Synchronization.
- Identification of the scrambling code.

25. What are the applications in satellites?

- Weather forecasting satellites
- Radio & TV broadcast satellites
- Military satellites
- Satellites for navigation
- Mobile communication

26. Define the terms:
(i). Earth Station,(ii). Uplink,(iii). Downlink.

Earth Station:-The antenna systems on or near the earth are referred to as Earth Station.

Uplink:-A transmission from an earth station to the satellite is referred to as Uplink.

Downlink:-A transmission from the satellite to the earth station is referred to as Downlink.

27. What are the factors limited the number of sub channels provided within the satellite channel?

There are three factors limited the number of sub channels provided within the satellite channel. They are:

- Thermal Noise.
- Inter modulation Noise.
- Cross talk.

28. What is meant by GEO?

GEO means Geostationary or Geosynchronous earth orbit.GEO satellites have a distance of almost 36000 km to the earth. Examples are almost all TV and radio broadcast satellites, many weather satellites and satellites operating as backbone for the telephone network.

29. What is communication satellite?

Communications satellite is an artificial satellite stationed in space for the purposes of telecommunications. Modern communications satellites use a variety of orbits including geostationary orbits, Molniya orbits, other elliptical orbits and low (polar and non-polar) Earth orbits.

30. What are the registers maintained by the gateway of satellite?

1. Home Location Register (HLR)
2. Visitor Location Register (VLR)
3. Satellite User Mapping Register (SUMR)

31. What are the advantages of LEO?

- Data rate is 2400 bit/s
- Packet delay is relatively low
- Smaller footprints of LEO allows frequency reuse
- Provide high elevations

32. Define the inclination angle and perigee.

The inclination angle is defined as the angle between the equatorial plane and the lane described by the satellite orbit. An inclination angle of 0 degrees means that the satellite is exactly above the equator. If the satellite does not have a circular orbit, the closest point to the earth is called the perigee.

33. Define the elevation angle and footprint.

The elevation angle is defined as the angle between the centre of satellite beam and the plane tangential to the earth's surface. The foot-print can be defined as the area on earth where the signals of the satellite can be received.

34. What are the advantages of GEO?

Three GEO satellites are enough for a complete coverage of almost any spot on earth, senders and receivers can use fixed antennas positions, and no adjusting is needed. Therefore GEO's are ideal for T.V and radio broadcasting

35. What is Handover?

The satellite is the base station in satellite communication systems and that it is moving. So, additional instance of handover are necessary due to the movement of the satellite

1. Intra Satellite handover:
2. Inter Satellite handover.
3. Gateway handover.
4. Inter System handover.

36. Advantages of MEO.

Using Orbits around 10,000Km, the system only requires a dozen satellites which is more than the GEO system, but much less than a LEO system. Furthermore these satellites move slower relative to the earth's rotation allowing a simpler system design. Depending on the inclination a MEO can cover larger populations, thus requiring less handovers.

37. What is browsing channel allocation and fixed channel allocation?

Cells with more traffic are dynamically allotted more frequencies. This scheme is known as browsing channel allocation, while the first fixed scheme is called fixed channel allocation.

38. Write short notes on DAB.

- MSC
- FIC
- DAB Frame Structure
- Components of DAB sender
- Multimedia Object Transfer Protocol

39. What are the two basic transport mechanisms used by DAB?

The two basic transport mechanisms used by DAB are:

1. Main Service Channel (MSC).
2. Fast Information Channel (FIC).

40. What are different interleaving and repetition schemes applied by DAB to objects and segments?

1. Object Repetition.
2. Interleaved Objects.
3. Segment repetition.
4. Header repetition.

41. What are the advantages of DAB?

1. DAB can offer sound in CD like quality.
2. DAB can use single frequency network where all senders transmitting the same radio program can operate at the same frequency.
3. DAB use VHF and UHF frequency bands.
4. DAB uses DQPSK modulation scheme.
5. DAB user COFDM and FEC.
6. DAB can transmit up to six stereo audio programmes with a data rate of 192kbit/s each.

42. What is object repetition?

DAB can repeat objects several times. If an object A consists of four segments (A1,A2,A3,A4) a single repetition pattern would be A1A2A3A4A1A2A3A4A1A2A3A4……..

43. State the different types of transport modes and the channel used to carry packets in Digital Audio Broadcasting.

- Two transport modes are possible in main service channel, namely, stream mode and packet mode.
- Each frame has three parts, namely synchronization channel, fast information channel and main service channel.

44. What is FIC?

The Fast Information Channel (FIC) contains Fast Information Block(FIB) with 256bits each(16 bit checksum). An FIC carries all control information which is required for interpreting the configuration and content of the MSC.

45. What is MSC?

Main Service Channel (MSC) carries all user data.eg. audio, multimedia data.

46. What are the two transport modes defined for MSC?

The two transport modes defined for MSC are:

- Stream Mode
- Packet Mode.

47. What are the goals of DVB?

The goal of DVB is to introduce digital TV broadcasting using satellite transmission (DVB-5)cable technology(DVB-c)and terrestrial transmission (DVB-7)

48. What is EIT?

Event Information Table (EIT) contains status information about the current transmission and some additional information for set-top boxes.

49. What is the service information sent by DVB?

Digital Video Broadcast Containers are basically MPEG-2 frames. DVB sends service information. This information is,

1. Network information Table (NIT).
2. Service Description Table (SDT).
3. Event Information Table (EIT).
4. Time and Date Table (TDT)

50. What are the advantages of DVB?

- Data rates planned for users are 6-38mbit/s for the downlink and 33-100kbit/s for the uplink.
- Transmitted along with TV programmes and doesn't require additional lines or hardware per customer.
- Can be used in remote areas and developing countries where there is no high band width wired network.

51. What is EY-NMPA?

Elimination yield -Non Pre-emptive Multiple Access (EY-NMPA) is a scheme which uses several phases to sense the medium. Access the medium and for contention resolution. Priority schemes can also be included. This is actually used in HIPERLAN1 specification.

UNIT III WIRLESS LAN

1. What are the Advantages of wireless LAN?

- Flexibility,
- Planning,
- Design,
- Robustness,
- Quality Service,
- Cost,
- Proprietary Solution,
- Restriction,
- Safety and Security

2. What are the Design Goals of Wireless LAN?

- Global Operation
- Low Power
- License-free Operation
- Robust transmission technology
- Simplified spontaneous co-operation
- Easy to use
- protection of investment
- Safety and Security
- Transparency for application

3. Mention some of the disadvantages of WLANS?

- Quality of service
- Proprietary solutions.
- Restrictions
- Safety and Security

4. Mention the features of radio transmission?

- Cover large areas.
- Can penetrate walls, furniture's.
- Does not need a LOS.
- Higher transmission rates.

5. What are the disadvantages of radio transmission?

- Shielding is not so simple.
- Can interfere with other senders.
- Limited ranges of license-free bands.

6. Mention the features of infrared transmission?

- Simple
- Extremely cheap
- Licenses are not needed
- Electrical devices do not interfere

7. What are Advantages and Disadvantages of Infrared?

Advantages:

- Simple and extremely cheap senders and receivers which integrated in almost all mobile devices
- No licenses are needed for infrared technology and shielding is very simple.
- Electrical devices do not interfere with infrared transmission.

Disadvantages:

i. Low bandwidth
ii. Quite easily shielded
iii. Cannot Penetrate

8. What is the difference between infrastructure and ad-hoc networks?

Infrastructure-based wireless networks:

Communication takes place only between the wireless nodes and the access point, but not directly between the wireless nodes.

Ad-hoc wireless networks:

Communication takes place directly with other nodes, so no access point Controlling medium access is necessary.

9. Define frequency hopping spread spectrum?

FHSS allows for the coexistence of multiple networks in the same area by separating different networks using different hopping sequences.

10. Define random back off time?

If the medium is busy, nodes have to wait for the duration of DIFS, entering a contention phase afterwards. Each node now chooses a random back off time within a contention window and delays medium access for this random amount of time.

11. What is the primary goal of IEEE 802.11?

The primary goal of the standard was the specification of a simple, robust, WLAN which offers time bounded and asynchronous services also it should be able to operate with multiple physical layers.

12. Is IEEE 802.11 and Wi-Fi same/ State the purpose of Wi-Fi.

Ans: No

It is wireless internet. Your laptop has an internal wireless card so you can connect to wireless routers. If you goto a hotel that advertises free wireless internet, you should be able to connect to it. You don't have to have an Ethernet cable to connect to the web at home either.

13. Why the PHY layer of IEEE 802.11 is subdivided? What about HiperLAN2 and Bluetooth?

- PLCP Physical Layer Convergence Protocol
- Clear channel assessment signal (carrier sense)
- PMD Physical Medium Dependent
- Modulation, coding
- PHY Management channel selection,
- MIB Station Management coordination of all management functions

14. What are the various versions of a physical layer defined in IEEE 802.11 standards?

- IEEE 802.11-83.5 MHz
- IEEE 802.11a -300 MHz
- IEEE 802.11b. 83.5 MHz
- IEEE 802.11g - 83.5 MHz

15. What are the system integration functions of MAC management?

- Synchronization
- Power management
- Roaming
- Management information base (MIB)

16. What is the main problem for WATM during handover?

The main problem for WATM during the hand over is rerouting of all connections and maintaining connection quality.

17. What are the different segments in ATM end-to-end connection?

- An ATM end-to-end connection is separated into different segments.
- A fixed segment is a part of the connection that is not affected by the handover
- Hand over segment is affected by the hand over and is located completely within a hand over domain.

18. What is meant by SIFS?

SIFS means Short Inter Frame Spacing. The shortest waiting time defined for short control message such as acknowledgements or polling response.

19. What is SCO?

SCO-stands for Synchronous Connection Oriented Link Standard telephone (voice) connection require symmetrical, circuit-switched, point-to-point connections. For this type of link, the master reserves two consecutive slots at fixed intervals.

20. What are the three phases in EY-NPMA?

i. **Prioritization:** Determine the highest priority of a data packet ready to be sent on competing nodes.

ii. **Contention:** Eliminate all but one of the contenders, if more than one sender has the highest current priority.
iii. **Transmission:** Finally, transmit the packet of the remaining node.

21. What do you meant by roaming?

Moving between access points is called roaming. Even wireless networks may require more than one access point to cover all rooms. In order to provide uninterrupted service, we require roaming when the user moves from one access point to another.

22. What is mobile routing?

Even if the location of a terminal is known to the system, it still has to route the traffic through the network to the access point currently responsible for the wireless terminal. Each time a user moves to a new access point, the system must reroute traffic. This is known as mobile routing.

23. What are the functions which support service and connection control?

- Access point control function
- Call control and connection control function
- Network security agent
- Service control function
- Mobility management function

24. What are the examples for service scenarios identified in WATM?

- Office environments
- Universities, schools, training, centers
- Industry
- Hospitals
- Home
- Networked vehicles

25. What is BRAN?

The broadband radio access networks (BRAN) which have been standardized by European Telecommunications Standard Institute(ETSI) are a possible choice for an RAL for WATM. Although BRAN has been standardized independently from WATM, there is co-operation between the two to concentrate the common efforts on one goal. The main motivation behind BRAN is the deregulation and privatization of the telecommunication sector in Europe.

26. What are the different network types of BRAN?

- Hyperlan1
- Hyperlan2
- Hyper access
- Hyperlink

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The main problem for WATM during the handover is rerouting of all connections and maintaining connection quality.

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An ATM end-to-end connection is separated into different segments.

- A fixed segment is a part of the connection that is not affected by the handover
- Handover segment is affected by the handover and is located completely within a handover domain.

29. What is anchor point?

The Anchor point is the boundary between a handover segment and a fixed segment.

30. What are different types of handover?

- Hard handover
- Terminal initiated
- Network initiated
- Network initiated, terminal assisted
- Network controlled
- Backward handover
- Forward handover

31. What is mobile terminal and wireless terminal?

- Mobile terminal is a standard ATM terminal with the additional capability of reconnecting after access point change. The terminal can be moved between different access points within a certain domain.
- Wireless terminal is accessed via a wireless link, but the terminal itself is fixed, i.e., the terminal keeps its access point to the network.

32. What are the three Low Power States provided by Bluetooth?

- PARK state
- HOLD state
- SNIFF state

33. Mention the elements of Bluetooth core protocols?

- Radio
- Baseband
- Link manager protocol
- Logical link control and adaptation protocol
- Service discovery protocol

34. What is the purpose of sniff state?

The sniff state has the highest power consumption. The device listens to the piconet at a reduced rate.

35. What is the use of hold state?

The device does not release its AMA but stops ACL transmission. A slave may still exchange SCO packets.

36. What is the purpose of park state?

In this state the device has the lowest duty cycle and the lowest power consumption. The device releases its AMA and receives a parked member address. The device is still a member of the piconet, but gives room for another device to become active.

37. How does registration on layer 3 of a mobile node work?

In the real system, a mobile node can connect to the network by using multiple interfaces with different access technologies such as Wi-Fi, CDMA. At the same time it can perform multiple connections for multiple services such as video, voice, or just chatting.

38. What are the advantages and problems of forwarding mechanisms in Bluetooth networks regarding security and power saving?

- **Advantage:** Bluetooth network enables setting up of the network without much preparation. It sets itself automatically.
- **Problems:** Security and power are major constraints. Security may be compromised and power may be spent on traffic not meant for a particular device.

39. Why Bluetooth specification comprises so many protocols and components?

The Bluetooth protocol stack, in common with all such standards, is specified as several separate layers

UNIT IV MOBILE NETWORK LAYER

1. **What are the requirements of mobile IP?**
   - Compatibility
   - Transparency
   - Scalability and efficiency
   - Security

2. **Mention the different entities in a mobile IP.**
   - Mobile Node
   - Correspondent Node
   - Home Network
   - Foreign Network
   - Foreign Agent
   - Home Agent
   - Care-Of address
     - Foreign agent COA
     - Co-located COA

3. **Define Mobile node:**

A mobile node is an end-system or router that can change its point of attachment to the Internet using mobile IP. The MN keeps its IP address and can continuously with any other system in the Internet as long as link layer connectivity is given.

4. **Explain Cellular IP.**

CellularIP provides local handovers without renewed registration by installing a single cellularIP gateway for each domain, which acts to the outside world as a foreign agent.

5. **What do you mean by mobility binding?**

The Mobile Node sends its registration request to the Home Agent. The HA now sets up a mobility binding containing the mobile node's home IP address and the current COA.

6. **Define COA.**

The COA (care of address) defines the current location of the MN from an IP point of view. All IP packets sent to the MN are delivered to the COA, not directly to the IP address of the MN. Packet delivery toward the MN is done using the tunnel. DHCP is a good candidate for supporting the acquisition of Care Of Addresses.

7. Define a tunnel.

A tunnel establishes a virtual pipe for data packets between a tunnel entry and a tunnel endpoint. Packets entering a tunnel are forwarded inside the tunnel and leave the tunnel unchanged.

8. What is encapsulation?

Encapsulation is the mechanism of taking a packet consisting of packet header and data putting it into the data part of a new packet.

9. What is decapsulation?

The reverse operation, taking a packet out of the data part of another packet, is called decapsulation.

10. Define an outer header.

The HA takes the original packet with the MN as destination, puts it into the data part of a new packet and sets the new IP header in such a way that the packet is routed to the COA. The new header is called the outer header.

11. Define an inner header.

There is an inner header which can be identical to the original header as this case for IP-in-IP encapsulation, or the inner header can be computed during encapsulation.

12. What is meant by generic routing encapsulation?

Generic routing encapsulation allows the encapsulation of packets of one protocol suite into the payload portion of a packet of another protocol suite.

13. Why is need of routing?

Routing is to find the path between source and destination and to forward the packets appropriately.

14. What is the use of network address translation?

The network address translation is used by many companies to hide internal resources and to use only some globally available addresses.

15. Define triangular routing.

The inefficient behavior of a non-optimized mobile IP is called triangular routing. The triangle is made up of three segments, CN to HA, HA to COA\MN, and MN back to CN.

16. What is meant by a binding cache?

One way to optimize the route is to inform the CN of the current location by caching it in a binding cache which is a part of the local routing table for the CN.

17. Define binding request.

Any node that wants to know the current location of an MN can send a binding request to the HA. The HA can check if the MN has allowed dissemination of its current location. If the HA is allowed to reveal the location it sends back a binding update.

18. What is known as Binding update?

This message sent by the HA to CNs reveals the current location of the MN. The message contains the fixed IP address of the MN and the COA. The binding update can request an acknowledgement.

19. Explain binding acknowledgement.

If requested, a node returns this acknowledgement receiving a binding update message.

20. Define binding warning.

If a node decapsulates a packet for a MN, but it is not the current FA for this MN, this node sends a binding warning. The warning contains MN's home address and a target node address.

21. What are the advantages of cellular IP?

- Manageability:
- Cellular IP is mostly self-configuring, and integration of the CIPGW into a firewall would facilitate administration of mobility-related functionality.
- Efficiency
- Transparency
- Security

22. What is known as mobility anchor point?

HMIPv6 provides micro-mobility support by installing a mobility anchor point, which is responsible for a certain domain and acts as a local HA within this domain for visiting MNs.

23. Explain destination sequence distance vector routing.

Destination sequence distance vector routing is an enhancement to distance vector routing for ad-hoc networks and is used as routing information protocol in wired networks.

24. What are the two things added to the distance vector algorithm?

- Sequence Numbers
- Damping

25. How the dynamic source routing does divide the task of routing into two separate problems?

1. Route discovery
2. Route Maintenance

26. How can DHCP be used for mobility and support of mobile IP?

Normally, a mobile node uses a care-of-address. In some cases, the mobile node may have to act as its own foreign agent by using co-located care of address. The means by which a mobile node acquires a co-located address is beyond the scope of mobile IP. One means is to dynamically acquire temporary IP address an the move using services such as DHCP.

27. List out the some of the popular Routing protocols.

- DSDV(Destination Sequence Distance Vector)
- DSR(Dynamic Source Routing)
- AODV(Ad-Hoc On Demand Vector Routing)

28. What is meant by Transparency?

Mobility should remain invisible for many higher layer Protocols and applications. The only affects of mobility should be a higher delay and lower bandwidth which are natural in the case of mobile networks.

29. Specify the field of minimal encapsulation method in mobile network layer.

- Minimal encapsulation doing,
- Avoids repetition of identical fields e.g. TTL, IHL, version, TOS
- Only applicable for unfragmented packets, no space left for fragment identification

30. What do you meant by roaming?

Moving between access points is called roaming. Even wireless networks may require more than one access point to coverall rooms. In order to provide uninterrupted service, we require roaming when the user moves from one access point to another.

31. What is mobile routing?

Even if the location of a terminal is known to the system, it still has to route the traffic through the network to the access point currently responsible for the wireless terminal. Each time a user moves to a new access point, the system must reroute traffic. This is known as mobile routing.

UNIT V TRANSPORT AND APPLICATION LAYERS

1. **What is slow start?**

TCP's reaction to a missing acknowledgement is necessary to get rid of congestion quickly. The behavior TCP shows after the detection of congestion is called slow start.

2. **What is the use of congestion threshold?**

The exponential growth of the congestion window in the slow start mechanism is dangerous as it doubles the congestion window at each step. So a congestion threshold is set at which the exponential growth stops.

3. **What led to the development of Indirect TCP?**

- TCP performs poorly together with wireless links
- TCP within the fixed network cannot be changed.

This led to the development of I-TCP which segments a TCP connection into a fixed part and a wireless part.

4. **What is the goal of M-TCP?**

The goal of M-TCP is to prevent the sender window from shrinking if bit errors or disconnection but not congestion cause current problems. It wants • To provide overall throughput

- To lower the delay
- To maintain end-to-end semantics of TCP
- To provide a more efficient handover.

5. **What do you mean by persistent mode?**

Persistent mode is the state of the sender will not change no matter how long the receiver is disconnected. This means that the sender will not try to retransmit the data.

6. **What are the characteristics of 2.5G/3.5G wireless networks?**

- Data rates
- Latency
- Jitter
- Packet loss

7. **What are the configuration parameters to adapt TCP to wireless environments?**

- Large Windows
- Limited Transmit
- Large MTU

- Selective Acknowledgement
- Explicit Congestion Notification
- Timestamp
- No header compression

8. State the requirements of WAP.

- Interoperable
- Scalable
- Efficient
- Reliable
- Secure

9. Name the layers of WAP.

- Transport layer
- Security layer
- Transaction layer
- Session layer
- Application layer

10. Name some ICMP messages.

- Destination unreachable
- Parameter problem
- Message too big
- Reassembly failure
- Echo request/reply

11. What is WTP? What are its classes?

WTP stands for Wireless Transaction Protocol. It has been designed to run on very thin clients such as mobile phones. It has three classes.

- Class 0: provides unreliable message transfer without any result message.
- Class 1: provides reliable message transfer without exactly one reliable result message.
- Class 2: provides reliable message transfer with exactly one reliable result message.

12. What is WSP?

The Wireless Session Protocol has been designed to operate on top of the datagram service WDP or the transaction service WTP. It provides a shared state between a client and a server to optimize content transfer.

13. Name some features of WSP adapted to web browsing.

- HTTP/1.1 functionality
- Exchange of session headers
- Push and pull data transfer
- Asynchronous request

14. What is WML?

The Wireless Markup Language is based on the standard HTML known from the www and on HDML. WML is specified as an XML document type.

15. What are the features of WML?

- Text and Images
- User interaction
- Navigation
- Context Management

16. What are the advantages of WML Script over WML?

WML Script offers several capabilities not supported by WML:
- Validity check of user input
- Access to device facilities
- Local user interaction
- Extension to the device software

17. Name the libraries specified by WML Script.

- Lang
- Float
- String
- URL
- WML Browser
- Dialogs

18. What are the classes of libraries?

- Common network services
- Network specific services
- Public services

19. Name the operations performed by PAP.

Push access Protocol performs the following operations:
- Push submission
- Result notification
- Push cancellation
- Status query
- Client capabilities query

20. What are the components of WAP2.0?

The protocol framework of WAP2.0 consists of four components:
- Bearer networks
- Transport services
- Transfer services
- Session services

21. What is the use of congestion threshold?

The exponential growth of the congestion window in the slow start mechanism is dangerous as it doubles the congestion window at each step. So a congestion threshold is set at which the exponential growth stops.

22. What is image scaling?

If a page contains a true color, high-resolution picture, this picture can be called down to fewer colors, lower resolution, or finally to only the title of the picture. The user can decide to download the picture separately. Further one can offer clipping, zooming, or detail Studies to users if they are interested in a part of the picture.

23. Define WAP

WAP is Wireless Application Protocol. It is the basic Objective of the WAP forum are to bring diverse Internet content and others data service to digital cellular phones and other wireless, mobile terminals. More ever a protocol suite should enable global wireless communication across different wireless network technologies. All WAP forum solution must be: interoperable, scalable, efficient, and reliable.

24. What is WML Browser?

WML Browser is a library that provides several functions typical for a browser, such as per to go back one card or refresh to update the context of the user interface.

25. What are the features of WML?

WML includes several basic features.
i) Text and Images
ii)User Interaction
iii)Navigation
iv)Context Management

26. What are the two functions of the transport layer in the internet?

The two functions of the transport layer in the internet are check summing over user data and multiplexing/ demultiplexing of data from applications.

27. What is called the exponential growth of the congestion window?

The senders always calculate congestion window for a window start size of the congestion window is one segment. Sender sends one packet and waits for acknowledgement. If acknowledgement arises it raises the level of congestion window by one. If sender sends two packets if acknowledgement arises it raises the level of congestion window by two. This scheme raises the level of congestion window every time the acknowledges come back, which takes roundtrip time (RTT).This is called the exponential growth of the congestion window.

28. Advantages of I-TCP:

- I-TCP does not require any changes in the TCP protocol as used by the hosts in the fixed network or other hosts in a wireless network that do not use this optimization.
- Without partitioning retransmission of lost packets would take place between mobile host and correspondent host across the whole network.
- Optimization of new mechanisms is quite simple to be done in I-TCP as they only cover a single hop.
- The short delay between the mobile host and foreign agent can be determined and is independent of other traffic streams. Therefore an optimized TCP can use precise time-outs to guarantee retransmission as fast as possible.
- Partitioning into two connections also allows the use of a different transport layer protocol between the foreign agent and the mobile host or the use of compressed headers etc. The foreign agent can act as a gateway to translate between different protocols.

29. Disadvantages of I-TCP:

- The loss of the end to end semantics of TCP cause problems if the foreign agent portioning the TCP connection crashes.
- An increased handover latency is more problematic in practical use
- The foreign agent must be a trusted entity because the TCP connections end at this point.

30. How does data transmission takes place?

Data transmission takes place using network adapters, fiber optics, copper wires, special hardware for routers etc.

31. Mention two WAP service provides. Find two cell phones supporting WAP and identify which WAP version they support.

Wireless application protocol (WAP) is a common effort of many companies and organizations to set up a framework for wireless and mobile web access using many different transport systems. Eg. GSM, GPRS, UMTS

32. How and why does I-TCP isolate problems on the wireless link? What are the main drawbacks of this solution?

The loss of the end to end semantics of TCP causes problems if the foreign agent portioning the TCP connection crashes. Increased handover latency is more problematic in practical use . The foreign agent must be a trusted entity because the TCP connections end at this point.

33. Can the problems using TCP for mobile communication be solved by replacing TCP with snooping TCP? Justify your answer.

Ans: yes

- buffering of packets sent to the mobile host lost packets on the wireless link (both retransmitted immediately by the mobile host ordirections!) will be foreign agent, respectively (so called .local. retransmission)
- the foreign agent therefore .snoops. the packet flow and recognizes acknowledgements in both directions, it also filters ACKs
- changes of TCP only within the foreign agent

34. What are the key elements of the WAP specification?

- Networks and Network Bearers
- TCP/IP as Transport Protocol
- Processors

35. What are the goals of WTLS layer?

It provides the upper-level layer of WAP with a secure transport service interface that preserves the transport service interface below it. In addition, WTLS provides an interface for managing (e.g., creating and terminating) secure connections. It provides functionality similar to TLS 1.0 and incorporates additional features such as datagram support, optimized handshake and dynamic key refreshing.

36. What is mean by SCPS-TP?

The set of protocols developed for space communication is known as space communications protocol standards (SCPS),the extended TCP is called SCPS-transport protocols.(SCPS-TP).

37. What are Advantage and Disadvantage of Mobile TCP?

Advantage:

i. M-TCP maintains the TCP end-to-end semantic. The SH does not send any ACK itself but forwards the ACKs from the MH.

ii. If the MH is disconnected, M_TCP avoids useless retransmissions, slow starts or breaking connections by simply shrinking the sender's window to 0;

iii. Since M-TCP does not buffer data in the SH as I-TCP does, it is not necessary to forward buffers to a new SH. Lost packets will be automatically retransmitted to the new SH.

Disadvantage:

i. As the SH does not act as proxy as in I-TCP, packet loss on the wireless link due to

bit errors is propagated to the sender. M-TCP assumes low bit error rates, which is not always a valid assumption.

ii. A modified TCP on the wireless link not only requires modification to the MH, protocol software but also new network elements like the bandwidth manager.

38. What is fast retransmit?

The gap in the packet stream is not due to severe congestion, but a simple packet loss due to a transmission error. The sender can now retransmit the missing packet before the timer expires. This behavior is called fast retransmit.

39. What is fast recovery?

The receipt of acknowledgement shows that there is no congestion justifying a slow start. The sender can continue with the current congestion window. The sender performs a fast recovery from the packet loss. This mechanism can improve the efficiency of TCP dramatically.

40. What is HTTP?

The Hypertext transfer protocol is a stateless, lightweight, application level protocol for data transfer between servers and clients. An HTTP transaction consists of an HTTP request issued by a client and an HTTP response from the server. Stateless means that all HTTP transactions independent of each other.

41. Define Damping.

Transient changes in topology that are short duration should not destabilize the routing mechanism .Advertisements containing changes in topology currently stored are therefore not disseminated further .A node waits with dissemination if these changes are most likely not yet stable. Waiting time depends on the time between the first and the best announcement.

42. Define WDP.

WDP is Wireless Datagram Protocol operates on top of many different bearer services capable of carry in data. At the T-SAP WDP offers a consistent datagram transport service independent of the underlying bearer.WDP offers source and destination port numbers used for multiplexing and demultiplexing of data respectively.

43. What are the three ways of WTA extends the WAE application model?

i) Content push: A WTA organ server can push the content.
ii) Handling of network events: A device can have a table indicating how to react to certain events from the mobile network.
iii) Access to telephony function: Application running on the client can access telephony functions from WML or WML script is very simple.

44. Define WCMP.

The wireless control message protocol provides error handling mechanism for WDP and should therefore be implemented. WCMP contains control messages that resemble the internet control message protocol for IPv4, messages and can also be used for diagnostic and informational purposes. WCMP can be used by WDP nodes and gateways to report error.

45. What are the capabilities of WML Script?

WML Script serves as a complement to WML and provides a general scripting capability in the WAP architecture. While all WML content is static WML Script offer several capabilities.

i) Validity check of user input
ii) Access to device facility
iii) Local user interaction
iv) Extensions to the device software

46. Define WSP.

The wireless session protocol has been designed to function on top of the datagram service WDP or the transaction service WTP. For both type security can be inserted using the WTLS security layer if required.WSP provide a shared state between a client and a server to optimize content transfer. HTTP, a protocol WSP tries to replace within the wireless domain.

47. What are key features of the current development in Internet technology?

- Improved radio technology and antennas
- Core network convergence
- Ad-hoc technologies
- Simple and open service platform