### Lesson Plan & Schedule (IT6601 – MOBILE COMPUTING)

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(Note: BB= Black Board, PP=Power Point Presentation, VIDEO = Video Lecture)

TEXT BOOK:

Lesson Plan & Schedule (IT6601 – MOBILE COMPUTING)

REFERENCES:

8. Windows Phone Dev Center: http://developer.windowsphone.com
1. What are the disadvantages of small cells?
   a) Infrastructure  b) Handover  c) Frequency

2. 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.

3. What are the benefits of reservation schemes?
   a) Increased no other station is allowed to transit during this slot
      b) Avoidance of congestion.
      c) Waiting time in clearly known.

4. What is Mobility?
   - A person who moves
     Between different geographical locations
     Between different networks
     Between different communication devices
     Between different applications
   - A device that moves
     Between different geographical locations
     Between different networks

5. Differentiate between free space loss and path loss.
   Free space loss
   1) Even if no matter exists between the sender and the receiver, signals still experience free space loss.
   2) There is a gradual degradation in the strength of the signal with the distance traveled.
   Path loss
   1) If there exists any matter between the sender and the receiver, then it experiences the path loss.
   2) There is a sudden decrease in the strength of the signal due to obstacles in the path.
6. 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.

7. Define multipath propagation

Radio waves emitted by the sender can either travel along a straight line, or they may be reflected at a large building or scattered at smaller obstacles. This leads to one of the most severe radio channel impairments called multipath propagation.

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

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

9. Define dwell time.

The time spent in a channel with a certain frequency is called the dwell time.

10. What are applications of Mobile Computing?

- Vehicles
- Emergencies
- Business
- Replacement of wired networks
- Infotainment
- Location dependent services
- Mobile and wireless devices

11. Why CSMA/CD scheme fails in wireless networks?

CSMA/CD is not really interested in collisions at the sender, but rather in those at the receiver. The sender applies carrier sense and detects an idle medium. The sender starts sending but a collision happens at the receiver due to a second sender. The sender detects no collision and assumes that the data has been transmitted without errors, but a collision might actually have destroyed the data at the mission. The power in the area of the transmitting antenna is several magnitudes higher than the receiving power.
12. 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

13. Define hidden terminal.

The transmission range of A reaches B but not C. The transmission range of C reaches B but not A. B reaches A and C. A cannot detect C and vice versa.

A starts sending to B, but C does not receive this transmission. C also wants to send something to B and senses the medium. The medium appears to be free, the carrier sense fails. C also starts sending, causing a collision at B. But A can’t detect this collision at B and continues with its transmission. A is hidden for C and vice versa.

14. 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)

15. What is orthogonal and autocorrelation thickness?

Orthogonal: Two vectors are called orthogonal if their inner product is 0. E.g.) the two vectors (2,5,0) & (0,0,17): (2,5,0)* (0,0,17)=0+0+0. Autocorrelation: The barker code (+1, -1, +1, +1, -1, +1, +1, -1, -1, -1) for example has a good autocorrelation (i.e.) the inner product with itself is large the result is 11.

16. What are the Advantages of wireless LAN?

- Flexibility
- Planning
- Design
- Robustness

17. Mention the merits and demerits of spread spectrum.

Merits:
- The main advantage is the resistance to narrowband interference.
- coexistence of several signals without co-ordination.
- robustness against narrowband interference.
- relative high frequency.
- characteristics like background noise.

Demerits:

* Increase in complexity of receivers that have to despread a signal.
* Large frequency band that is needed due to the spreading of the signal.

18. Mention some of the disadvantages of WLANS?
   - Quality of service
   - Proprietary solutions.
   - Restrictions
   - Safety and Security

19. Why can waves with a very low frequency follow the earth’s surface? Why are they not used for data transmission in computer networks?

The waves with low frequencies follow the earth’s surface and can propagate long distance. Generally, the lower the frequency, the better the penetration.

Low frequency waves are bent by the atmosphere due to refraction. High frequency waves follow straight line of sight. This enables direct communication with satellites or microwave link on the ground.

20. Describe about MAC layer in DECT architecture.

The medium access control (MAC) layer establishes, maintains and releases channels for higher layers by activating and deactivating physical channels. MAC multiplexes several logical channels onto physical channels. Logical channels exist for signaling network control, user data transmission, paging or sending broadcast messages. Additional services offered include segmentation/reassembly of packets and error control/error correction.

21. Why don’t radio waves always follow a straight line? Why is reflection both useful and harmful?

We have a line of sight between the sender and the receiver of the radio signals. Mobile phones are typically used in big cities with skyscrapers, on mountains, inside buildings, while driving through an alley, etc.

Here several effects occur in addition to the attenuation caused by the distance between the sender and the receiver.

Reflection is useful because, It helps transmitting signals as soon as no line of sight exists.
Reflection is harmful because, The reflected signal is not as strong as original, as objects can absorb some of the signal’s power.

22. What are the 3 fundamental propagation behaviors depending on their frequency?

- Ground wave
- Sky wave
- Line of Sight

23. What are the basic tasks of the MAC layer?
- Medium access
- Fragmentation of user data
- Encryption

24. What’s the use of Phase Lock Loop (PLL)?

To receive the signal correctly, the receiver must synchronize in frequency and phase with the transmitter.

25. What are the basic services provided by the MAC layer?
- Asynchronous data service (mandatory)
- Time-bounded service (optional)

26. What is OVSF?

Using orthogonal code separation of data streams of a sender UMTS uses so-called orthogonal variable spreading factor codes (OVSF).

27. What are the techniques used for MAC management?
- Synchronization
- Power management
- Roaming
- Management information base (MIB)

28. 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.

29. Describe about MAC layer in DECT architecture.

The medium access control (MAC) layer establishes, maintains and releases channels for higher layers by activating and deactivating physical channels. MAC multiplexes several logical channels onto physical channels. Logical channels exist for signaling network control, user data transmission, paging or sending broadcast messages. Additional services offered include segmentation/reassembly of packets and error control/error correction.

30. Specify the steps to be performed during the search for a cell after power on?

- Primary synchronization
31. 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.

32. Define hidden terminal.

The transmission range of A reaches B but not C. The transmission range of C reaches B but not A. B reaches A and C. A cannot detect C and vice versa.

A starts sending to B, but C does not receive this transmission. C also wants to send something to B and senses the medium.

The medium appears to be free, the carrier sense fails. C also starts sending, causing a collision at B. But A can’t detect this collision at B and continues with its transmission. A is hidden for C and vice versa.

33. What is digital sense multiple access?

The scheme which is used for the packet data transmission service cellular Digital packet Data in the AMPS mobile phone system is also known as digital sense multiple access (DSMA).

34. What is called burst and normal burst?

Data is transmitted in small portions called bursts. Normal burst are used for data transmission inside a slot.

35. What is Mobile Computing and the applications?

Mobile computing is the process of computation on a mobile device. In such computing, a set of distributed computing systems or service provider servers participate, connect, and synchronise through mobile communication protocols.

APPLICATONS:

i) Mobile computing offers mobility with computer power.
ii) It provides decentralized computations on diversified devices, systems, and networks, which are mobile, synchronized, and interconnected via mobile communication standards and protocols.
iii) Mobile computing facilitates a large number of applications on a single device.

36. What is frequency hopping spread spectrum and mention their variants?

The total available bandwidth is split into many channels of smaller bandwidth plus guard spaces between the channels, hopping take place between the transmitter and receiver staying on one of these channels. This is known as Frequency hopping spread spectrum.
37. **What do you mean by spread factor?**

It determines the bandwidth of the resulting signal in direct sequence spread spectrum

\[ S = \frac{t_b}{t_c} \]

where 

- \( t_b \) – user bit duration; 
- \( t_c \) – chip duration

38. **Limitations of Mobile Computing?**

- Resource constraints. 
- Interface 
- Bandwidth 
- Dynamic changes in communication environment. 
- Network issues. 
- Interoperability issues. 
- Security constraints.

39. **What are the types of antennae?**

- Theoretical 
- Real 
- Directional 
- Multi-element 
- Smart

40. **What are the different considerations for a signal to be propagated?**

- Transmission Range 
- Detection Range 
- Interface Range

41. **Give the difference between the network 1G, 2G, 2.5G, 3G mobile communication?**

- **1G** - Voice-only communication. 
- **2G** – Communicate voice as well as data signals. 
- **2.5G** – Enhancements of the second generation and sport data rates up to 100 kpbs. 
- **3G** – Mobile devices communicate at even higher data rates and support voice, data, and multimedia streams. High data rates in 3G devices enable transfer of video clips and faster multimedia communication.

42. **Mention the several effects when a signal is propagated.**
43. What is MAC?
Message authentication codes (MAC) are also used to authenticate messages during transmission. MAC of a message is created using a cryptographic MAC function which is similar to the hash function but has different security requirements.

44. What do you mean by Digital Signature?
Digital signatures are used to enable verification of the records. A DSA (Digital Signature Algorithm) is used to sign a record before transmitting. It provides for a variable key length of maximum 512 or 1024 bits. The DSS (Digital Signature Standard) is based on the DSA. Signatures enable identification of the sender, identify the origin of the message, and check message integrity.

45. Define the term wireless?
Wireless telecommunications refers to the transfer of information between two or more points that are not physically connected. Distances can be short, such as a few metres for television remote control, or as far as thousands or even millions of kilometers for deep-space radio communications.
It encompasses various types of fixed, mobile, and portable applications, including two-way radios, cellular telephones, personal digital assistants (PDAs).

46. Explain the difference between wired and wireless networks

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<td>- high bandwidth</td>
<td>- low bandwidth</td>
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<td>- low bandwidth variability</td>
<td>- high bandwidth variability</td>
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<tr>
<td>- can listen on wire</td>
<td>- hidden terminal problem</td>
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<td>- high power machines</td>
<td>- low power machines</td>
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<td>- high resource machines</td>
<td>- low resource machines</td>
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<tr>
<td>- need physical access (security)</td>
<td>- need proximity</td>
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<tr>
<td>- low delay</td>
<td>- higher delay</td>
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UNIT-II

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

2. What are the two basic transport mechanisms of DAB?

Main service channel (MSC): It carries all user data. The MSC consists of common interleaved frames (CIF) i.e, data fields of 55,296 bits that are sent every 24 ms. A CIF consists of capacity units (CU) with a size of 64 bits which form the smallest addressable unit within a DAB system.

3. 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

4. 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.

5. What is the need of SIM?

   The need for SIM is that one can personalize any MS using his or her SIM i.e. user-specific mechanisms like charging and authentication are based on the SIM not on the device itself.

6. How is authentication performed in GSM systems?

   Authentication is based on the SIM, which stores the individual authentication key Kj, the user identification IMSI and the algorithm used for authentication A3.

   The VLR sends the random value RAND to the SIM. Both sides network and subscriber module perform the same operation with RAND and the Kj called A3. The MS sends back the SRES (signed response) generated by the SIM. The VLR can now compare both values. If they are the same, the VLR accepts the subscriber, otherwise the subscriber is rejected.
7. Explain Cellular IP.

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

8. What is MOT? Give its primary goal.

DAB faces a broad range of different receiver capabilities. So to solve this problem it defines a common standard for data transmission, the multi-media object transfer (MOT) protocol.

The primary goal of MOT is the support of data formats used in other multi-media systems.

9. What is SUMR?

An important register in satellite networks is the satellite user mapping register (SUMR). This stores the current position of satellites and a mapping of each user to the current satellite through which communication with a user is possible.

10. 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.

11. 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.

12. 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.

13. What is the primary goal of GSM?

The primary goal of GSM was to provide a mobile phone system that allows users to roam throughout Europe and provides voice services compatible to ISDN and other PSTN systems.

14. Differentiate GSM and DECT.
GSM
1. Global systems for mobile Communications
2. Range is up to 70km.

DECT
1. Digital enhanced cordless telecommunications
2. Range is limited to about 300m.

15. What are the two new network elements in GPRS architecture?

Gateway GPRS support node (GGSN): It is the inter-working unit between the GPRS network and external packet data networks (PDN). Serving GPRS support node (SGSN): It supports the MS.

16. Describe about MAC layer in DECT architecture.

The medium access control (MAC) layer establishes, maintains and releases channels for higher layers by activating and deactivating physical channels. MAC multiplexes several logical channels onto physical channels. Logical channels exist for signaling network control, user data transmission, paging or sending broadcast messages. Additional services offered include segmentation/reassembly of packets and error control/error correction.

17. 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.

18. Describe the three subsystems of GSM.

Radio subsystem (RSS): It comprises all radio specific entities i.e. the mobile stations (MS) and the base station subsystem (BSS).

Networking and switching subsystem (NSS): The heart of the GSM system is formed by the NSS. This connects the wireless network with standard public networks.

Operating subsystem (OSS): It monitors and controls all other network entities.

19. What are the applications of satellites?

- Weather forecasting
- Radio and TV broadcast satellites
- Military satellites
- Satellites for navigation

20. What is decapsulation?

The reverse operation, taking a packet out of the data part of another packet, is called decapsulation.
21. What is MOT? Give its primary goal.

DAB faces a broad range of different receiver capabilities. So to solve this problem it defines a common standard for data transmission, the multi-media object transfer (MOT) protocol. The primary goal of MOT is the support of data formats used in other multi-media systems.

23. What is SUMR?

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24. Give the two basic reasons for a handover in GSM.

The mobile station moves out of the range of a BTS or a certain antenna of a BTS. The received signal level decreases continuously until it falls below the minimal requirements for communication. The error rate may grow due to interference. All these effects may diminish the quality of the radio link. The wired infrastructure may decide that the traffic in one cell is too high and shift some MS to other cells with a lower load. Handover may be due to load balancing.

25. Give the security services offered by GSM.

Access control and authentication Confidentiality Anonymity

26. What is the primary goal of GSM?

The primary goal of GSM was to provide a mobile phone system that allows users to roam throughout Europe and provides voice services compatible to ISDN and other PSTN systems.

27. Differentiate GSM and DECT.

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30. Give the full form for the following: a) CKSN b) EIR c) DTMF d) MOC  
a) CKSN- Ciphering key sequence number b) EIR- Equipment Identity Register  
c) DTMF- Dual Tone multiple frequency d) MOC- Mobile originated call

31. Define Snooping TCP?  
A protocol in which an agent buffers the packets from the fixed connection layer for transmission to the mobile node on a wireless transceiver; the agent also buffers the packets on the wireless transceiver from the node for transmitting to a layer at the fixed line. The agent snoops at the transmission and reception in place of acknowledgement-or-timeout-based TCP method in the mobile part of the network.

32. Define Mobile TCP?  
A method of splitting the TCP layer into two TCP sub-layers using a mechanism that reduces window size to zero. The split is asymmetric; The window is set to zero to prevent the transmission from the TCP transport layer at the mobile node (MN) or at the fixed node when disconnection is noticed. The window opens again on getting the packet, there is no slow start by the base transceiver and it is presumed that packet loss is due to disconnection and not due to congestion or interference.

33. Explain the concept “Fast Retransmit/ Fast Recovery Transmission”?  
A method in which there are four or more phases of fast retransmit and fast recovery – first phase as slow start and beginning (exponential), then fast retransmit/recovery phase 1 (FRR1) on three duplicate acknowledgements, fast retransmit/fast recovery phase 2 (FRR2), and wait (Constant time out and window size).

34. Define T-TCP?  
A protocol which is efficient and is used in situations where short messages are to be sent in sequence and a packet is delivered after the SYN and SYN_ACK packet exchanges and the connection closes after the packet exchanges of FIN, FIN_ACK, and CLOSING.

35. Define ISR?  
Interrupt Service Routine(ISR):  
A program unit (function, method, or subroutine) which runs when a hardware or software event occurs and running of which can be masked and can be prioritized by assigning a priority.

36. Define IST?  
Interrupt Service Thread(IST):  
A special type of ISR or ISR unit (function, method, or subroutine) which initiates and runs on an event and which can be prioritized by assigning a priority.

37. Features of TCP?  
The main features of TCP are:  
1) Transmission as data Streams  
2) Buffering and retransmission  
3) Session-start, data transfer, and session-finish fully acknowledged end to end. 4) In-order delivery  
5) Congestion Control and avoidance
38. What is explicit notification?
   A method of congestion control by explicit notification of congestion, for example, when a base
   transceiver at the receiver end is not able to transmit a packet to the mobile node then it sends an ESBN
   (explicit bad state notification) to the sender (on fixed line) at the other end.

39. What is selective retransmission?
   A method in which there is an additional acknowledgement, known as selective acknowledgement; a
   timeout is set at transmitting end for receiving SACKs. Only the lost packet corresponding to a SACK needs
   to be retransmitted.

40. Methods of Congestion Control.
   The methods of congestion control:
   1) Slow start and congestion avoidance
   2) Fast recovery after packet loss
   3) Fast retransmit and fast recovery
   4) Selective acknowledgement
   5) Explicit congestion notification

41. TCP header.
   A header used in the TCP protocol; it consists of fields in five 32-bit words
   followed by words for the option fields and padding.

42. Describe the three subsystems of GSM.
   Radio subsystem (RSS): It comprises all radio specific entities i.e. the mobile stations (MS) and the
   base station subsystem (BSS).
   Networking and switching subsystem (NSS): The heart of the GSM system is formed by the NSS.
   This connects the wireless network with standard public networks.
   Operating subsystem (OSS): It monitors and controls all other network entities.

43. What are the applications of satellites?
   ✓ Weather forecasting
   ✓ Radio and TV broadcast satellites
   ✓ Military satellites
   ✓ Satellites for navigation

44. Application Layer protocols
   ✓ File Transfer Protocol (FTP)
   ✓ Trivial File Transfer Protocol (TFTP)
   ✓ Network File System (NFS)
   ✓ Simple Mail Transfer Protocol (SMTP)
   ✓ Terminal emulation protocol (telnet) Remote login application (rlogin)
   ✓ Simple Network Management Protocol (SNMP)
Domain Name System (DNS)
Hypertext Transfer Protocol (HTTP)

45. What is meant by footprint?

A footprint can be defined as the area on earth where the signals of the satellite can be received.

UNIT III

1. Define GSM?

The global system for mobile communication (GSM) was developed by Groupe Speciale Mobile (GSM) which was founded in Europe in 1992. The GSM is a standard for mobile telecommunication through a cellular network at data rates of up to 14.4 kbps. Nowadays it consists of a set of standards and protocols for mobile telecommunication.

2. Define GPRS?

General Packet Radio Service (GPRS) is a packet-oriented service for mobile devices data communication which utilizes the unused channels in TDMA mode in a GSM network and also sends and receives packet of data through the internet.

3. What are subsystems in GSM system?

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

4. 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)

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

- Intra cell Handover
- Inter cell Intra BSC Handover
- Inter BSC Intra MSC Handover
- Inter MSC Handover

6. 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.

7. What are the security services offered by GSM?

The security services offered by GSM are:
- Access control and authentication.
- Confidentiality.
8. 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.

9. 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).

10. 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)

11. 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.

12. 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.

13. 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.

14. 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.

15. Expand GSM, GPRS and UMTS.

- Global System for Mobile Communication (GSM)
- General Packet Radio Service (GPRS)
- Universal Mobile Telecommunication System (UMTS)

16. Mention the types of Interface in GSM system and its use.

- A interface
• Makes the connection between the RSS and the NSS
• Based on circuit-switched PCM-30 systems (2.048 Mbit/s), carrying up to 30 64 kbit/s connections

- 0 interface
• Makes the connection between the RSS and the OSS
• Uses the Signalling System No.7 (SS7) based on X.25 carrying management data to/from the RSS

- U interface
• Makes the connection between the BTS and MS
• Contains all the mechanisms necessary for wireless transmission

- Ab. interface
  • Makes the connection between the BTS and BSC Consists of 16 or 64 kbit/s connections

17. What is RSS?
• RSS stands for Radio subsystem (RSS)
• RSS comprises all radio specific entities

18. Name the entities of RSS.
• Base Station Subsystem (BSS)
• Base Transceiver Station (BTS)
• Base Station Controller (BSC)
• Mobile Station (MS)

19. Mention the advantages of GSM.
• Communication
• Total mobility
• Worldwide connectivity
• High capacity
• High transmission quality
• Security functions

20. What does SIM card contain?
• a personal identity number (PIN)
• a PIN unblocking key (PUK)
• an authentication key Ki
• the international mobile subscriber identity (IMSI)

21. Mention the disadvantages of GSM.
• No end-to-end encryption of user data
• Reduced concentration while moving
• Electromagnetic radiation
• High complexity of system
• Several incompatibilities within the GSM standards
• Card-type
• Serial number
• A list of subscribed services

22. Mention the use of SS7.
   • Used for handling all signaling needed for
     connection setup,
     connection release and
     connection release and
     handover of connections to other MSCs

UNIT- IV
MOBILE AD-HOC NETWORKS

1. What are MANET design issues?
   a. Network size and node density
   b. Connectivity
   c. Network topologies
   d. User traffic
   e. Operational environment
   f. Energy constraint

2. What are the characteristics of mobile ad hoc network?
   o Lack of fixed infrastructure
   o Dynamic topologies
   o Bandwidth constrained, variable capacity links
   o Energy constrained operation
   o Increased vulnerability

3. What is wireless ad-hoc network?
   A wireless ad hoc network (WANET) is a decentralized type of wireless network. The network is ad hoc because it does not rely on a pre-existing infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks.
4. What are MANET design issues?
   a. Network size and node density
   b. Connectivity
   c. Network topologies
   d. User traffic
   e. Operational environment
   f. Energy constraint

5. What MANET performs whenever there is an incoming packet in a MANET?
   - Forward the packet to the next node.
   - While forwarding the packet, the sender needs to ensure:
     i. The packet moves towards its destination.
     ii. The number of hops/path length is minimized.
     iii. Delay is minimized.
     iv. The packet loss is minimized.
     v. The packet does not move around the network endlessly.

5. What are the features of MANET routing protocol?
   1. Capable to identify network topology after changes due to mobility.
   2. Scheduling of packet transmission and channel assignment.

6. Define - DSR
   **Dynamic Source Routing** (DSR) is a *routing* protocol for wireless mesh networks. It is similar to AODV in that it forms a *route* on-demand when a transmitting node requests one. However, it uses *source routing* instead of relying on the *routing* table at each intermediate device.

7. Define - AODV
   *Ad hoc On-Demand Distance Vector (AODV)* Routing is a routing protocol for mobile ad hoc networks (MANETs) and other wireless ad hoc networks.
8. Define - DSDV

Destination-sequenced distance-vector routing (DSDV) is a table-driven routing scheme for ad hoc mobile networks based on the Bellman–Ford algorithm. It was developed by C. Perkins. The main contribution of the algorithm was to solve the routing loop problem.

9. What is link state routing protocol?

Link-state routing protocols, such as OSPF and IS-IS, create a topology of the network and place themselves at the root of the tree. Link-state protocols implement an algorithm called the shortest path first (SPF, also known as Dijkstra's Algorithm) to determine the path to a remote destination.

10. Define DSR protocol

Dynamic Source Routing (DSR) is a routing protocol for wireless mesh networks. It is similar to AODV in that it forms a route on-demand when a transmitting node requests one. However, it uses source routing instead of relying on the routing table at each intermediate device.

11. What are the important steps in DSDV?

1. Each router in the network collects route information from all its neighbors.
2. After gathering the information, the node determines the shortest path to the destination based on gathered information.
3. Based on gathered information, a new routing table is generated.
4. The router broadcasts the table to its neighbors. On receipt by neighbors, the neighbors’ node recomputed their respective routing table.

12. What are reactive protocols?

On-demand (reactive) routing. This type of protocol finds a route on demand by flooding the network with Route Request packets. The main disadvantages of such algorithms are: high latency time in route finding.

13. What are proactive protocols?

Proactive protocols. In networks utilizing a proactive routing protocol, every node
maintains one or more tables representing the entire topology of the network. These tables are updated regularly in order to maintain up-to-date routing information from each node to every other node.

14. What are the application of MANET?
   - Communication among portable computers
   - Environmental monitoring
   - Military
   - Emergency applications.

15. What is routing?

Routing is the process of selecting best paths in a network. In the past, the term routing also meant forwarding network traffic among networks. However, that latter function is better described as forwarding.

16. What is IS-IS protocol?

Intermediate System to Intermediate System (IS-IS) is a routing protocol designed to move information efficiently within a computer network, a group of physically connected computers or similar devices. It accomplishes this by determining the best route for datagram’s through a packet-switched network.

UNIT – V

MOBILE PLATFORMS AND APPLICATIONS

1) What is an android?

Android was developed by Google and the Open Handset Alliance (OHA), a coalition of hardware, software and telecommunications companies. More than 30 companies were involved in the OHA, including Qualcomm, Broadcom, HTC, Intel, Samsung, Motorola, Sprint, Texas Instruments and Japanese wireless carriers KDDI and NTT DoCoMo.

2) What are the four layers of android structure?
   - Application layer
   - Application Frameworks
   - Libraries and runtimes KERNEL
3) What are the types of mobile operating system?
   Symbian, Android, Windows mobile, Palm OS, Blackberry, iOS

4) What is palm OS?
   Palm OS is the computer operating system that provides a software platform for the Palm series of handheld personal digital assistants (PDAs) made by Palm Inc.

5) What is the function of IOS?
   - Integrated search support enables simultaneous search through files, media, applications and email.
   - Gesture recognition supports, for example, shaking the device to undo the most recent action.

6) What is the significance of device os?
   - It moderates the relationship between the computer and its peripherals.
   - It helps in the management of files, copying, deleting, moving of files from one storage location to the other. It encourages the memory for its efficient usage and thus adding the speed of the computer.

7) What are the constraints of mobile device OS?
   - Limited memory
   - Limited screen size
   - Miniature keyboard

8) What is a blackberry OS?
   BlackBerry OS is a proprietary mobile operating system designed specifically for Research In Motion’s (RIM) BlackBerry devices. The BlackBerry OS runs on Blackberry variant phones like the BlackBerry Bold, Curve, and Pearl and Storm series.

9) What is M-Commerce? Give two advantage?

   "M-Commerce is the use of mobile devices to communicate, inform transact and entertain using text and data via a connection to public and private networks." (Lehman
Advantages:

- **Completely Customization**: the service provider has access to data about the user’s preferences and status which facilitates better, personalized service.

- **More Convenience**: the small size and ease of use of mobile receivers, coupled with freedom from problems caused by infrastructure, makes for a higher degree of user convenience.

10) What is a mobile payment system?

**Mobile payment**, also referred to as mobile money, mobile money transfer, and mobile wallet generally refer to payment services operated under financial regulation and performed from or via a mobile device. Instead of paying with cash, cheque, or credit cards, a consumer can use a mobile phone to pay for a wide range of services and digital or hard goods.

11) What is microkernel OS?

In computer science, a microkernel (also known as \(\mu\)-kernel) is the near-minimum amount of software that can provide the mechanisms needed to implement an operating system (OS). These mechanisms include low-level address space management, thread management, and inter-process communication (IPC).

12) What are the features of SYMBIAN?

Multitasking real time, 32-bit OS and it runs on the ARM based processors design and also the design of symbian OS is microkernel based.

8. What are the advantages of android?

- It has open platform and suitable for many mobile phones.
- It needs lower footprint of 250 kB.
- It supports libraries and robust in nature.
  - It has an integrated web browsing.
9. What are the two features of windows phone?
   - For security cryptography library is available.
   - virtual memory management is provided.
   - The GWE can handle input and output
   - An improved version of windows mobile os support multitasking.

15) What are the disadvantages of mobile OS?
   If any problems affected in OS, you may lose all the contents which have been stored already. Unwanted user can use your own system.
   - What are the advantages m-commerce?
     - Mobile handheld devices can be personalized.
     - Advantages of using M-Commerce in business organization includes, cost savings, business opportunities.
     - M-Commerce is user friendly, providing lightweight, flexibility etc.

   - What are the disadvantages of m-commerce?
     - The mobile devices has small screen which might limit user’s menu choice, text typing capabilities.
     - Mobile devices usually do not provide processing power or graphics of personal computers.
     - Restricted bandwidth limits reach of M-Commerce everywhere in practical scenario.

   - What is mobile payment system?
     - Mobile payments are a natural evolution of E-Payment schemes.
     - It may be defined as initiation, authorization and confirmation of a financial transaction using a mobile device.
Types of mobile payment schemes:

- Bank account based
- Credit card based
- Micro payment

17. What are the desirable properties of a mobile payment system?

- Easy to use
- General purpose
- Interoperability
- Trust

20) What are the security issues of mobile payment system?

Users of mobile devices can be difficult to trace because of roaming of the user. Also the mobile devices go online and offline frequently. Thus attackers would be very difficult to trace. A major is the lack of any satisfactory mechanism available at present to authenticate a particular user.

**PART B**

1. Explain the special features that an operating system for mobile device needs to support

2. Explain in detail, microkernel operating system.

3. Explain the principle functions of the operating system of a mobile device

4. Compare the features provided by the following operating system: Android, Symbain, Windows phone

5. Explain in detail, the architecture of Android operating system.

6. Explain the flexibilities that a user would be required to sacrifice when a single tasking operating system is used in the mobile device.

7. Explain the applications of M – Commerce.
8. Explain in detail, Mobile payment system.
10. Explain the various security issues in mobile payment system.
UNIT I

PART A

1. What is Mobile computing?
2. Define wireless communication.
3. Mention application of Mobile computing.
4. Distinguish between mobile computing and wireless networking.
5. State the challenges in wireless communication.
6. Mention the objective of MAC protocol.
7. State the issues of wireless MAC protocol.
8. Analyse the problems of Wireless Transmission.
9. Explain the Characteristics of Mobile computing.
10. Explain the type of wireless networks.
11. Distinguish between infrastructure-based network and infrastructure less network.
12. Describe the function of presentation, application and data tier of mobile environment.
13. What problem does hidden terminal creating during wireless communication?
15. Classify the MAC Protocol.
16. What is the role of a MAC protocol?
17. Identify the specific reasons as to why the MAC protocol designed for infrastructure based wireless may not work satisfactory in infrastructure less environment.
18. When does the exposed terminal problem arise?
19. Why collision detection is based protocol not suitable for wireless networks?
20. What is MACA protocol? In which environment is it suitable?

PART B

1. State & explain the various applications of mobile computing.
2. Explain the architecture of a mobile computing environment.
3. Define the function of the presentation, application and data tier of mobile computing environment.
4. Explain the working of a contention-based MAC protocol. Give two examples of contention based MAC protocol.
5. What are the principle responsibilities of the MAC Protocol?
6. How do MAC protocol for wireless networks differ from those in wired network?
7. Explain why do MAC scheme in wired network fail in wireless networks and how does the multiple access with collision avoidance (MACA) scheme work?
8. What are the board categories of MAC protocols? Name one popular from each of these categories.
9. Explain the various random assignment schemes that are used in MAC protocol.
10. Compare the mechanisms of TDMA, FDMA, and CDMA with their functions
11. What do you mean by a schedule based MAC Protocol? Name a schedule based MAC protocol.
12. What is FDMA & TDMA? Briefly explain its working and at least one of its important applications.
13. Explain the basic scheme of the CDMA protocol.
14. What is the role of a pseudorandom generator in the working of the CDMA protocol?

UNIT II
PART A

1. What are the disadvantages of mobile IP?
2. Explain about agent solicitation
3. What do you mean by encapsulation?
4. What do you mean by the term binding of mobile node?
5. How to create mobile IP along with basic requirements?
6. Explain the need for mobile IP.
7. Explain the term mobile node.
8. Discuss about agent discovery.
9. Describe about Tunnelling.
10. Define reverse tunnelling.
11. Define COA.
12. State the application of DHCP.
13. What are the main functions of DHCP?
14. Show the indirect TCP model with neat diagram.
15. Discuss about congestion control.
16. Discuss about mobile TCP.
17. Explain about indirect TCP.
18. Describe the term snooping TCP
19. Describe slow start.
20. Explain Advantage and Disadvantage of Mobile TCP.

PART B

1. Explain why the traditional IP cannot be used in a mobile network. What are the main differences between the traditional IP and the mobile IP? How does mobile IP support mobile hubs?
2. Explain the following terms associated with mobile IP a) Home address b) Mobile node c) Foreign Agent d) Foreign Network e) Home network
3. Write short notes on the following a) Corresponding Node b) Care of address c) Agent Discovery d) Tunnelling and Encapsulation
4. a) Explain the operation of mobile IP with the help of a suitable schematic diagram and by suitable examples b) Explain the agent advertisement procedure of mobile IP
5. Give a brief account of route optimization in Mobile IP
6. a) Why do congestion occur in a network? Explain how does TCP detect and handle congestion. B) Explain the working of freeze-TCP.
7. Explain the layered architecture of the TCP/IP protocol suite and compare it with the ISO/OSI architecture.
8. What is slow start in TCP operation? Explain its working. How does slow start help improve the performance of TCP?
9. Define I-TCP and Explain Indirect TCP(I-TCP) with the help of a suitable schematic diagram.
10. Briefly discuss the M-TCP approach of extending TCP to work efficiently in mobile wireless networks. How does M-TCP maintain end to end semantics?

UNIT III
PART A

1. List the Services of GSM
2. Describe the function of HLR and VLR.
3. Define MSC
4. Discuss about BSS.
5. Describe about BTS.
6. Define BSC.
7. Explain the need for EIR.
8. Define OMC
9. List the Services of GSM.
10. Illustrate the functions of GGSN.
11. Mention the categories of GPRS services
12. Describe the definition for GPRS.
13. What are the advantages of GPRS over GSM?
14. What is UMTS?
15. Identify at least three dissimilarities between a GMS network and UMTS network
16. How UMTS networks are different from 2G network?
17. How to develop the Anonymity?
18. Define VHE
19. Point out the major functions in NSS
20. List out the data base involved in GSM.

PART B
1. Describe in detail about the system architecture of Global System for Mobile communication
2. Explain how a GSM network provides security to the customers.
3. Briefly explain how the mobile cellular communication has evolved over different generations of technology
4. Briefly discuss the important functional difference between 1G, 2G and 3G cellular networks.
5. Explain briefly about categories of GSM services
6. Explain GPRS architecture in detail.
7. Describe the GPRS procedure in detail.
8. What is UMTS? Describe the functions of HLR and VLR in call routing & roaming?
9. What do you mean by VHE? Explain how VHE is realized in 3G networks?
10. Do mobile phones affect the human body negative? Explain your answer.

UNIT IV
PART A

1. What is ad hoc network?
2. Explain the need for Ad Hoc networks.
3. Define applications of MANETs.
4. Conclude the characteristics of MANETs.
5. Classify the MANET routing algorithms.
7. Can cellular network and wireless LAN be considered as ad hoc networks? Justify
8. Discuss about security in MANETs.
9. What are the issues that are addressed by routing protocol in MANET?
10. Why traditional routing strategies cannot be deployed in a MANET?
11. Discuss about dynamic source routing.
12. Describe count to infinity problem.
13. What do you mean by unicast and multicast communication in a MANET?
14. What is hybrid routing protocol
15. What do you mean by dynamic topology of MANET?
16. Compare DSDV and DSR
17. Explain CGSR.
18. List the advantages in DSR.
19. Discuss VANET.
20. How VANET differ from a traditional MANET?

PART B

1. Describe at least three applications of mobile ad hoc networks.
2. What do you mean by size and node density of MANET? Explain any two terms and discuss how these two parameters impact the design of a MANET.
3. What problem does dynamic topology cause in the design of routing protocol? How are these problem addressed in a popular MANET routing protocol?
4. Briefly explain why traditional packet routing protocol for wired network cannot be used straightaway in a MANET. Discuss how the routing protocols for traditional wired network have been extended to work in a MANET
5. Explain any one routing techniques that can be used in a mobile ad hoc network.
7. Discuss DSDV routing in detail.
8. Discuss DSR routing in detail.
9. Explain how is multicast routing carried out in ad-hoc networks.
10. What is a VANET? Explain how does it differ from traditional MANET? Explain any one application of VANET.

UNIT V
PART A

1. What is microkernel operating system?
2. Name three commercial operating system for mobile phones
3. How is the operating system for mobile phone different from the operating system for desktop?
4. What are the advantages of mobile operating system?
5. What are the disadvantages in the context of the design of mobile operating system?.
6. Explain mobile payment system.
7. List applications of M-commerce.
8. Explain BTL2B and BTL2C commerce.
9. Describe micropayment in M-Commerce.
10. Mention different payment system are available.
11. Why is microkernel preferred for developing a mobile OS?
12. List any two features of Android.
13. List any two features of Symbian.
14. List any two features of window Phone.
15. Describe UIQ interface.
17. Describe Blackberry operating system.
18. Compare any two features of android, Symbain OS and Window Phone7.
19. Draw a structure of sensor operating system.
20. How an operating system for sensor network is different from traditional operating system?

PART B

1. Explain the special features that an operating system for mobile device needs to support compared to the features provided by a traditional operating system
2. Define microkernel operating system. Why microkernel is based design being preferred for developing a mobile OS?
3. Explain the principle functions of the operating system of a mobile device. Discuss how an example application can be implemented on a mobile device and the specific operating system service that it make use of.
4. Compare the features provided by the following mobile operating system: Android, symbain and windows Phone7
5. Discuss the architecture of the Android operating system. Briefly identify the possible reasons as to why it has been able to rapidly improve its market share compared to its peers since its introduction few years ago.

6. Using at least one suitable example, explain the flexibilities that a user would be required to sacrifice when a single tasking operating system is used in the mobile device.

7. Explain any two application of M-commerce.

8. What do you understand by the mobile payment system? Examine an application where mobile payment may be useful. Explain the different payment systems that are available.

9. a) What do you understand by M-commerce? What are the advantages and disadvantages of M-commerce? B) Define Micropayment. How is micropayment achieved?

10. What do you mean by BTL2B and BTL2C commerce? Give examples of MCommerce for these two categories of Commerce.