DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE – 637 215.
COURSE / LESSON PLAN SCHEDULE

STAFF NAME: P.MAHENDRAN
SUBJECT: 16EC772 - WIRELESS NETWORKS CLASS: IV ECE (A & B)

A). TEXT BOOKS

1. Kaveh Pahlavan.Prashant Krishnamurthy "Principles of Wireless Networks"- Pearson Education- Delhi- 2002and PHI- 2005
2. C.Siva Ram Murthy and B. S.Manoj "Ad Hoc Wireless Networks Architectures and Protocols"- PearsonEducation -2nd Edition -Delhi -2014

B). REFERENCE BOOKS

3. Rappaport, T.S., "Wireless communications", Pearson Education, 7th Impression, 2012.
4. Dharma Prakash Agarwal and Qing Anzeng, "Introduction to Wireless and Mobile Systems", Thomson Learning, 2nd edition 2007
5. Jochen Schiller, "Mobile Communications", Pearson Education, Reprint 2011
6. Williams Stallings, "Wireless communications and Communications", Pearson Education, Delhi, 2002

C). LEGEND:

L 1	Lecture 1	Tx 1	Text Book 1	BB	Block Board
OHP	Over Head Projector	PPT	Power Point	T 1	Tutorial 1
PP	Pages	Rx 1	Reference Book 1		

Sl. No	Lecture Hour	Topics to be covered	Teaching Aid Required	Book No./Page No
UNIT-I INTRODUCTION				
1.	L1	Fundamentals of wireless communication	BB	TX2/pp 40-41, Rx3/pp 1-25, Rx4/pp 1-25, Rx2/pp 1-11
2.	L2	Spectrum overview	BB	TX2/pp 41-45, Rx4/pp 56-68, Rx2/ pp 38-46
3.	L3	Air interface design	BB	TX2/pp 45-50, Rx3/pp 46-55, Rx4/pp 68-70, Rx4/pp 85-88,
4.	L4	Signal propagation	OHP	TX2/pp 206-211, Rx3/pp137-171, Rx4/pp 94-116, Rx2/pp 109-144
5.	L5	Path loss modeling and signal coverage	BB	Rx2/pp 211-215, Rx3/pp 55-61, Rx2/pp 109-44
6.	L6	Effects of multipath and doppler	BB	TX2/pp 215-225, Rx3/pp 55-61, Rx4/pp 70-74, Rx4/pp 88-89
7.	L7, L8	Characteristics of the wireless channel	OHP	TX2/pp 582-586,RX4/pp 86-88
8.	L9	Optical wireless networks.	BB	TX2/pp 570-580, Rx3/pp 61-72, Rx4/pp 89-94
UNIT- II NETWORK PRINCIPLES				
13.	L10	Wireless medium access alternatives	BB	Tx2 /pp 27-28 Tx1 /pp 44-46
14.	L11, L12	Fixed assignment access for voice-oriented networks	BB	Tx1 /pp 46-50
15.	L13, L14	Random access for data oriented	BB	Tx1 /pp 50-58

		networks		
16.	L15, L16	Integration of voice and data traffic	OHP	Tx1 /pp 58-68
17.	L17, L18	Wireless network topologies	BB	Tx1 /pp 68-71
UNIT- III WIRELESS LAN				
18.	L19	Fundamentals of WLAN	BB	TX 1/ pp 239 - 240, 247 - 248
19.	L20, L21	IEEE 802.11 WLAN Standard, architecture and services, physical layer	BB	TX 1/ pp 240 - 248
20.	L22	MAC sub layer – MAC management sub layer	BB	TX 1/ pp 249 - 257
21.	L23	IEEE standards	OHP	TX 1/ pp 262
22.	L24	HIPER LAN	BB	TX 1/ pp 325 – 335
23.	L25	Bluetooth	BB	TX 1/ pp 335 – 337
24.	L26	Home RF	BB	TX 1/ pp 263 - 300
25.	L27	Wireless ATM, WBRAN	BB	TX 1/ pp 263 - 300
UNIT – IV NETWORK OPERATIONS				
26.	L28	Wireless Network Operation	BB	Rx2 /pp 266
27.	L29	Mobility Management	BB	Rx2 /pp 266-284
28.	L30	Radio Resources and Power Management	BB	Rx2 /pp 284-297
29.	L31	Security in Wireless Networks	OHP	Rx2 /pp 297-310
30.	L32	Wireless WANs	LCD	Rx2 /pp 319
31.	L33	GSM and CDMA Technology	BB	Rx2 /pp 320-327
32.	L34	IS-95, IMT-2000	BB	Rx2 /pp 350-355
33.	L35	Mobile Data Networks, DPD Networks	BB	Rx2 /pp 371-376
34.	L36	GPRS, Wi Fi - LTE / LTEA.	BB	Rx2 /pp 379
35. UNIT-V INFRASTRUCTURELESS NETWORK				
36.	L37	Introduction to ad hoc networks Characteristics, Issues	BB	Rx1 /pp 213-215
37.	L38	Medium Access Scheme, Routing	LCD	Rx1 /pp 226
38.	L39	Multicasting, Transport Layer Protocols	BB	Rx1 /pp 227
39.	L40	Pricing Scheme, Quality of Service Provisioning	BB	Rx1 /pp 228
40.	L41	Self Organization, Security – Addressing and Service Discovery	BB	Rx1 /pp 230
41.	L42	Energy Management – Scalability	BB	Rx1 /pp 231
42.	L43	Deployment Considerations – Applications	BB	Rx1 /pp 232
43.	L44	Wireless sensor networks :Introduction, characteristics, issues, applications	OHP	TX2/pp 582-586,RX4/pp 86-88
44.	L45	Comparison of Adhoc and wireless sensor networks	BB	TX2/pp 582-586,RX4/pp 86-88

UNIT-I

1. **What are the digital modulation schemes used in wired transmission techniques?(Remembering)(CO1)**
   Amplitude shift keying (ASK)**,** Frequency shift keying (FSK), Phase shift keying (PSK), or quadrature amplitude modulation (QAM).

2. **List out the consideration in the design of wireless modems.(Understanding)(CO1)**
   Bandwidth Efficiency, power Efficiency, out-of –band radiation, Resistance to Multipath, constant envelope modulation.
3. **What are the two facets of the power requirement? (Remembering)(CO1)**
   One is the power needed to operate the electronics in the terminal. Other is the amount of power needed at the output of the power amplifier in order to radiate a given amount of signal power from the antenna.
4. **What are the digital wireless transmission techniques? (Remembering)(CO1)**
   Pulse transmission techniques, Basic modulation techniques and Spread spectrum systems.
5. **What are the steps involved in base band transmission? (Remembering)(CO1)**
   I) Line coding, ii) pulse modulation.
6. **What are the two methods for spread spectrum transmission? (Remembering)(CO1)**
   There are two basic methods for spread spectrum transmission:
   Direct sequence spread spectrum (DSSS) and Frequency hopping spread spectrum (FHSS).
7. **What is a frequency hopping? (Remembering)(CO1)**
   The shifts in frequency, or frequency hops, occur according to a random pattern that is Known only to the transmitter and the receiver.
8. **Define equalization techniques. (Remembering)(CO1)**
   In-band time diversity and exploiting time diversity these two approaches serve the same purpose of equalizing the effects of the channel, and for that reason they are referred to as equalization techniques
9. **What are the diversity techniques? (Remembering)(CO1)**

1. Time diversity techniques 2. Frequency diversity techniques 3. Space diversity techniques.

10. **What are the coding techniques used in wireless communication? (Remembering)(CO1)**

    1. Error control coding 2.speach coding 3.coding for spread spectrum systems.

11. **What is multicarrier modulation? (Remembering)(CO1) (April/ May 2008).**
    MCM takes the advantage of orthogonality of the channel and develops efficient implementation using FFT algorithm. In this system, the received signal power is measured in different sub channels and the modulation or coding of the subcarrier is changed to improve the performance.
12. **What do you understand about Ultra Wide Band (UWB) technology(Understanding)(CO1) (Apr/ May 2008).**
    It is used in short range communication. In this technique, a very narrow width and low power pulses (less than 1 ns) are used for transmission. The spectrum of this pulse occupies wideband (in GHz).
13. **What are the advantages of UWB pulse transmission? (Remembering)(CO1) (May/June 2009).**
    In these techniques, a very narrow width and low power pulses (less than 1 ns) are used for transmission, low power, high bandwidth and signal processing gain that interference from existing systems into the system is negligible, its implantation is easy.
14. **How is a wireless network different from a wired network? State at least two differences(Understanding)(CO1).(Nov/Dec 2008)**
    A wired medium can provide reliable, guided link which conducts an electric signal associated with the transmission of information of from one fixed terminal to another. The wireless medium is unreliable. It has a low bandwidth. It supports mobility. Wireless transmission share the same medium which is nothing but air.
15. **What is the primary goal of IEE 802.11? (Remembering)(CO1) (May/June 2009).**

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

16. What are Advantages of wireless LAN? (Remembering)(CO1)

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

17. What are Design Goals of Wireless LAN? (Remembering)(CO1)

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.

18. What are the three Low Power States provided by Bluetooth? (Remembering)(CO1)

PARK state, HOLD state, SNIFF state

19. Define a LAN. (Remembering)(CO1)

A Local Area Network (LAN) is a privately owned network within a single office,Buildings or campus, covering a distance of a few kilometers.

20. What is HIPERLAN? (Remembering)(CO1)

The HIPERLAN stands for High Performance Radio LAN and was initiated by the RES-10 group of the ETSI as a pan-European standard for high-speed wireless localNetwork.

21. What are the functional requirements for the HIPERLAN-1? (Remembering)(CO1)

Data rates of 23.529 Mbps, Coverage of up to 100M, Multi-hop ad hoc networking capability, Support of time-bounded services, Support of power saving

22. What are two periods of contention phase of the HIPERLAN-1? (Remembering)(CO1)

I) Elimination ii**)** yield are the two contention phase.

23. What are two features required for the WLAN and cellular systems? (Remembering)(CO1)

i) Support for vertical roaming between local area and wide areas as well as Between corporate and public environments.

ii) Support for QoS control for integration into multiservice voice-oriented back bone PSTN WHICH include ATM switches AND OTHER facilities.

24. Define HIPERLAN-2 (May/June 2009). (Remembering)(CO1)

HIPERLAN-2 aims at IP and ATM type services at high data for indoor and possibly outdoor applications. It expects to support both connectionless and connection-oriented services which will make its MAC layer far more complicated than 802.11 and HIPERLAN-1 that support only connectionless services.

25. Name the five major challenges for implementation of wireless LANs that existed the beginning of this industry. (April/ May 2008). (Analyzing)(CO1)

Complexity and cost, Bandwidth, Coverage, Interference, Frequency Administration.

26. What is a HAN? (Nov/Dec 2008). (Remembering)(CO1)

HAN means Home Area Network

27. What is home RF? (Remembering)(CO1)

The home RF working group has developed a specification for wireless communications in the home called shared wireless access protocol (SWAP). The SWAP specification defines new common interface that supports wireless voice and data networking in the home. The SWAP specification defines a new common interface that supports wireless voice and data networking in the home. The SWAP specifications an extension of DECT (using TDMA) for voice and a relaxed 802.11(CSMA/CA) for high-speed data applications.

28. What is Bluetooth? (Nov/Dec 2008). (Remembering)(CO1)

Bluetooth is the popular technology for short-range, ad hoc networking that is designed for a integrated voice and data applications. Unlike WLANs, Bluetooth has a lower data rate, but it has an embedded mechanism to support voice application. Unlike 3G cellular

systems, Bluetooth is an inexpensive personal area ad hoc network operating in unlicensed bands and owned by the user.

29. What are the three modes of operating in Bluetooth? (Remembering)(CO1)

Bluetooth has three modes of operation- no secure, service-level, and link-level security.

30. What are the characteristic of radio wave propagation? (Remembering)(CO1)

Signal modulation mechanism and multiple access technique

31. What are the methods of radio propagation mechanism? (Remembering)(CO1)

Reflection, diffraction, scattering

32. What is reflection? (Remembering)(CO1)

Reflection occurs when a propagating electromagnetic wave impinges upon an object, This has very large dimension when compared to the wavelength of propagating wave

33. What is diffraction? (Remembering)(CO1)

Diffraction occurs when the radio path between the transmitter and receiver is obstructed by a surface that has sharp irregularities.

34. What is scattering? (Remembering)(CO1)

Scattering occurs when the medium through which the wave travels consists of objects with Dimensions that are small compared to the wavelength and where the number of obstacles Per unit volume is large.

35. Define path loss? (Remembering)(CO1)

Path loss can be expressed as the ratio of power of the transmitted signal to the power of the same signal received by the receiver, on a given path.

36. What is fading? (Remembering)(CO1)

Fading refers to the fluctuations in signal strength when received at the receiver.

37. What are the types of fading? (Remembering)(CO1)

Fast fading/small-scale fading and slow fading /large- scale fading.

38. State the effects of multipath Propagation (Remembering)(CO1) (April/May 2008)

1. Rapid change in signal strength over a small travel distance or time interval.
2. Random frequency modulation due to varying Doppler shifts on different multipath signals.
3. Time dispersion (echoes) caused by multipath propagation delays.

39. What is meant by Doppler Shift? (Remembering)(CO1)

The Phase change in received signal due to the difference in path length hence the apparent change in frequency is called Doppler shift.

$F_d = v/\lambda \cos\theta = 1/2\pi\ (\Delta\Phi/\Delta t)$.

BIG QUESTIONS

1. List out the different types of diversity techniques and explain each with necessary diagram. **(Analyzing)(CO1)** (April/May 2008), .(Nov/Dec 2008)
2. Explain inter- symbol interference. With source of ISI? What techniques can be used to compact ISI? **(Remembering)(CO1)**
3. Explain the spread spectrum receivers can exploit multipath diversity using RACK receivers. **(Remembering)(CO1)**
4. write shorts on: **(Remembering)(CO1)**
   a. What is block interleaving? How it useful in combating the effects of fast fading?
   b. Write short notes on frequency hopping and direct-sequence spread spectrum.
5. What are the considerations needed in the design of wireless modems? (Nov/Dec 2008)

UNIT II

1. **What are the two fundamental types of topologies used in wireless networks? (Remembering)(CO2)**

   i) Infrastructure Networks Topology **ii)** Ad HOC Networks Topology

2. **Define Infrastructure Networks Topology. (Remembering)(CO2)**

In the infrastructure topology there is a fixed (wired) infrastructure that supports communication between mobile terminals and fixed terminals. The infrastructure networks are often designed for large coverage areas and multiple base station or access point operation.

3. **Define Ad Hoc networks Topology. (Remembering)(CO2)**

Ad hoc or distributed network topology applies to reconfigurable networks that can operate without the need for fixed infrastructure. These networks are primarily used by the military and also few commercial for voice and data transmission.

4. **Name the five different cell types in the cellular hierarchy.(Understanding)(CO2)**

I) Femto cells II) Pico cells III) micro cells IV) macro cells V)mega cells

5. **Why hexagonal cell shape preferred over square or triangular cell shapes to the cellular architecture? (Analyzing)(CO2)**

A hexagonal cell is the closest approximation to a circle of these three and has been used traditionally for system design. The argument for a hexagonal shape crones from the fact that among the three shapes mentioned, for a given radius (largest possible distance between the polygon center and its edge),the hexagon has the largest area.

6. **Define cell splitting. (Nov/Dec 2008). (Remembering)(CO2)**

As the number of subscribers increase within a given area, the number of channels allocated to a cell is no longer sufficient for supporting the subscriber demand. It then becomes necessary to allocate more channels to the area that is being covered by this cell. This can be done by splitting cells into smaller cells and allowing additional channels in the smaller cells.

7. **What is the use of Directional Antennas for cell sectoring? (Understanding)(CO2)**

The simplest and the most popular scheme for expanding the capacity of cellular systems is cell sectoring using directional antennas. This technique attempts to reduce the signal-to-interference ratio and thus reduce the cluster size, thereby increasing the capacity. This antenna is the reduction in co channel interference that results by focusing the radio propagation in only the direction where it is required.

8. **Define Lee's microcell method. (Remembering)(CO2)**

Lee's microcell zone technique exploits corner excited BS to reduce the number of handoffs and eliminate portioning of channels between sectors of a cell.

9. **What is mean by overlaid cell concept method? (Remembering)(CO2) (May/June 2009).**

The overlaid cell concept introduced in the section on cell splitting can be used to increase the capacity of a cellular network. Here, channels are divided among a larger microcell that coexists with a smaller microcell contained entirely within the macro cell. The same BASE STATION serves both the macro and microcell.

10. **Compare FCA and DCA frequency assignment techniques. (Analyzing)(CO2)**

Attribute	Fixed Channel Allocation	Dynamic channel Allocation
Traffic load	Better under heavy traffic load	Better under light/moderate traffic load
Flexibility in channel allocation	low	high
Suitability of cell size	macro cellular	microcellular
Call setup delay	low	high

11. **What is called correspondent node? (Remembering)(CO2)**

An MN is a terminal that can change its location and thus its point of attachment. The partner for communication is called the correspondent node (CN) that can be either a fixed or a mobile node.

12. **What is sleep modes? (Remembering)(CO2)**

A common approach for saving battery is to allow the MS to enter into a sleep mode during periods of inactivity.

13. **Define Co-channel and adjacent channel interference(Remembering)(CO2) (April/ May 2008).**
ACI is the interference that a transmitting radio presents to the user channels immediately above and below the users channel.
14. **What is Ping-Pong effect? (Remembering)(CO2) (April/ May 2008).**
If the mobile station frequently crosses the boundary of location. Then, there is a effect of continually switching between two location areas. This is known as ping pong effect.
15. **Define ACI. (Remembering)(CO2)**
The Adjacent-channel interference (ACI), which is the interference that a transmitting radio presents to the user channels immediately above and below the transmitting users channel, is a major parameter in the design of cellular systems. The ACI determines the geographic area where mobile users can be served by a single base station.
16. **What is the function of Medium Access Control Layer? (Remembering)(CO2)**
The functions of Medium Access Control Layer are responsible for establishes, Maintains, and releases channels for higher layers by activating and deactivating physical channels.
17. **What do you meant by roaming? (Remembering)(CO2)**
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.
18. **Why is power control important in CDMA? (Remembering)(CO2) (April/ May 2008).**
Fast power control mechanism is needed to minimize interference and soft handoff.
19. **What is an ad hoc network topology? (Remembering)(CO2) (Nov/Dec 2008).**
It is applied to reconfigurable networks. These networks are operated without fixed infrastructure.
20. **What is Temporary channel borrowing? (Remembering)(CO2) (May/June 2009).**
In temporary channel borrowing high-traffic cells return the borrowed channels after the call is completed.
21. **What is Static channel borrowing? (Remembering)(CO2) (May/June 2009).**
The static channel borrowing are no uniformly distributed among cells according to the available statistics of the traffic and changed in a predictive manner.
22. **Medium access (MAC) (Remembering)(CO2)**
For broadcast networks, the method of determining which device has access to the Transmission medium at any time CSMAICD and token are common access methods.
23. **What are the two type of handover? (Remembering)(CO2)**
    - Internal handover is between BTS that belong to the same BSS
    - External handover are between two different BSS belong to the same MSC.
24. **What is the use of MTP and SCCP? (Remembering)(CO2)**
The message transport protocol (MTP) and the signaling connection control part(SCCP) of SS-7 are used for error-free transport and logical connection respectively.
25. **What are the three types of major classes of mobile station? (Remembering)(CO2)**
Vehicle mounted, portable, and handheld terminals.
26. **What are the four type bursts for traffic and control signaling? (Remembering)(CO2)**
The normal burst(NB), frequency correction burst, synchronization burst and random access burst.
27. **What are the two type of traffic channel? (Remembering)(CO2)**
Full-rate traffic channeland half-rate traffic channel.
28. **What are the three classes of control channel? (Remembering)(CO2)**
Frequency control channel (FCCH), synchronization channel (SCH), broadcast control channel (PCCH).

BIG QUESTIONS

1. Explain in brief about the different types of Path loss modeling. **(Remembering)(CO2)**
2. Discuss about the Radio Propagation Mechanism in detail. **(Analyzing)(CO2)**

3. Discuss the effects of multipath Fading and Doppler Effect. **(Analyzing)(CO2)**
4. With the Key parameters compare the Fixed assignment for Voice oriented Networks. **(Remembering)(CO2)**
5. Compare various accessing techniques.(TDMA,FDMA,CDMA) **(Understanding)(CO2)**
6. Explain in detail about the ALOHA based wireless Random Access Techniques. **(Remembering)(CO2)**
7. Explain in detail about the CSMA based Wireless Random Access Techniques. **(Remembering)(CO2)**
8. Write short notes on Ad hoc Network Topology. **(Remembering)(CO2)**
9. Explain in brief about the method to calculate signal to interference ratio. **(Remembering)(CO2)**
10. What are the different types available to expand the channel capacity. **(Remembering)(CO2)**
11. With necessary diagram explain how the capacity is increase by using directional antennas for cell sectoring and cell splitting. .(April/May 2008) **(Remembering)(CO2)**

UNIT III

1. **Name the three sub-systems in the GSM architecture? (Remembering)(CO3)**
   Mobile station, base station sub-system and network and switching sub-system.
2. **What are the services available in GSM? (Remembering)(CO3)**
   Teleservices, bearer services and supplementary services.
3. **Write the application of IS-634? (Remembering)(CO3)**
   The IS-634 applications include call processing, radio resources management, mobility management and transmission facilities management.
4. **What are the four type of IS-95 logical channel? (Remembering)(CO3)**
   Pilot channel, synchronization channel, paging channel and traffic channel.
5. **How the reverse channels differ from that of the forward channel? (Analyzing)(CO3)**
   Compare with the forward channel, there is no spreading of the data symbols using orthogonal codes instead, the orthogonal codes are used for waveform encoding this means that the reverse link employs an orthogonal modulation schemes that consumes bandwidth but reduce the error rate performance of the system.
6. **Define CDMA. (Remembering)(CO3)**
   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 characteristic1. Orthogonal. 2. AutoCorrelation.
7. **What is meant by GPRS? (Remembering)(CO3)**
   The General Packet Radio Service provides packet mode transfer for applications
   That exhibit traffic patterns such as frequent transmission of small volumes.
8. **What is the information in SIM? (Remembering)(CO3)**
   Card type, serial no, list of subscribed services**,** Personal Identity Number(PIN)**,**Pin Unlocking Key(PUK)**,**An Authentication Key(AK)
9. **What are Advantage and Disadvantage of Mobile TCP? (Remembering)(CO3)**
   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 iv.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 are propagated to the sender's-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 MHProtocol software but also new network elements like the bandwidth manager.

10. **Why is W-CDMA? (Nov/Dec 2008). (Analyzing)(CO3)**
    3 GPP means third Generation Partnership Project. Its second edition is known as 3 GPP2. 3 GPP specified standard is referred as WCDMA.
11. **How many physical channels are available in each IS-95 carrier and what type of coding separates these channels from one another? (Analyzing)(CO3) (Nov/Dec 2008).**
    The IS-95 forward channel consists of four types of logical channel, namely pilot channel synchronization channel, paging channel and traffic channels. These channels are separated from one another by using different spreading codes.
12. **What are the types of multiple access techniques?** TDMA, FDMA, CDMA.
13. **Give the advantage of TDMA. (Remembering)(CO3)**
    Flexibility,ii) Time-slot assignments among multiple users III) Different access rate for different users
14. **Why is power control important in CDMA? (April/ May 2008). (Analyzing)(CO3)**
    Fast power control mechanism is needed to minimize interference and soft Handoff.
15. **Define Handoff. (Remembering)(CO3)**
    When the signal strength drops below a desired level, it automatically seeks a cell where the from the mobile unit is stronger. The computer at the MTSO causes the transmission from the vehicle to be switched from the weaker cell to the stronger cell. This is called handoff.
16. **What are the two steps in handoff? (Remembering)(CO3)**
    In the first step, the handoff management process determines that a hand off is required (hand off decision and initiation).ii. In the second step, the rest of the network is made aware of the handoff, and the Connection is restructured to reflect the new location of the mobile station.
17. **What are the two steps in handoff? (Analyzing)(CO3)**
    i.In the first step, the handoff management process determines that a handoff is required (handoff decision and initiation).
    ii. In the second step, the rest of the network is made aware of the handoff, and the connection is restructured to reflect the new location of the mobile station.
18. **Principals of confusion and diffusion. (Analyzing)(CO3)**
    The former introduces a layer of scrambling that creates confusion as to what exactly might be the transmitted message. The later creates a randomness whereby the effect of changing a small part of plaintext message will result in changing half of the encrypted cipher text.
19. **What is meant by Message authentication? (Remembering)(CO3)**
    Message authentication is a security service that provides two functions: sender authentication and message integrity.
20. **What is WAP? (Remembering)(CO3)**
    For integrating cellular telephony and the internet by providing web content and advanced services to mobile telephone users. The WAP protocol is expected to help implementation of a variety of applications that include internet access, m-commerce, multimedia email, tele-medicine, and mobile geo-positioning.
21. **Define i-mode. (Remembering)(CO3)**
    I-mode is a service that tries to eliminate the use of a gateway and provide direct access to the internet to the extent possible. These terminals transmit data at 9600 bps that allows graphics and small text messaging on a larger screen than the WAP. This display allows six to 10 lines of text at 16 to 20 characters per line that can be color or monochrome.

BIG QUESTIONS

1. What are the key parameters to control the mobility management? **(Remembering)(CO3)**

2. Explain in brief about the power management mechanism in cellular network.**(Remembering)(CO3)**

3. Discuss in brief about the wireless network security. **(Analyzing)(CO3)**

4. With the necessary blocks explain in detail about the IS- 95 CDMA Forward Channel.(No/De2008).**(Remembering)(CO3)**

5. How the reverse channel of IS-95 CDMA differs from the forward channel.**(Analyzing)(CO3)**
6. Explain in detail about the W-CDMA. **(Remembering)(CO3)**
7. With the block explain about CDPD architecture. **(Remembering)(CO3)**
8. Write short note on Mobile Application protocols. **(Remembering)(CO3)**
9. With necessary diagram explain generic handoff management.**(Remembering)(CO3)** (April/May 2008)

10. Discuss on power saving mechanism in wireless network. **(Analyzing)(CO3)**

   a. Find out the expression for the signal to interference ratio in a cell
   b. ii. Compare peer to peer and multi hop ad hoc topologies .(Nov/Dec 2008)

11. List and explain the four mechanisms that are embedded in all voice oriented wireless networks that allow a mobile to establish and maintain connection with networks. **(Analyzing)(CO3)** (April/May 2008)

12. Discuss the different logical channel used in the GSM networks. **(Analyzing)(CO3)** (April/May 2008)

13. With necessary diagram explain the GPRS system architecture.**(Remembering)(CO3)** (April/May 2008)

UNIT - IV

1) Define medium access scheme. (Remembering)(CO4)

The primary responsibility of a medium access control (MAC) protocol in ad hoc wireless networks is the distributed arbitration for the shared channel for transmission of packets.

2. Define Hidden terminal. (Remembering)(CO4)

Hidden terminals are nodes that are hidden (or not reachable) from the sender of a data transmission session, but are reachable to the receiver of the session. In such cases, the hidden terminal can cause collisions at the receiver node. The presence of hidden terminals can significantly reduce the throughput of a MAC protocol used in ad hoc wireless networks. Hence the MAC protocol should be able to alleviate the effects of hidden terminals.

3. Define Exposed terminal. (Remembering)(CO4)

Exposed terminals, the nodes that are in the transmission range of the sender of an on-going session, are prevented from making a transmission. In order to improve efficiency of the MAC protocol, the exposed nodes should be allowed to transmit in a controlled fashion without causing collision to the on-going data transfer.

4. Define access delay. (Remembering)(CO4)

The access delay refers to the average delay that any packet experiences to get transmitted. The MAC protocol should attempt to minimize delay.

5. Define resource reservation. (Remembering)(CO4)

The provisioning of QOS defined by parameters such as bandwidth, delay, and jitter requires reservation of resources such as bandwidth, buffer space, and processing power.

6. **What are the Advantages of directional antennas? (Remembering)(CO4)**

This has many advantages that include increased spectrum reuse, reduction in interference, and reduced power consumption. Most of the existing MAC protocols that use Omni directional antennas do not work with directional antennas.

7. What is meant by routing? (Remembering)(CO4)

The responsibilities of a routing protocol include exchanging the route information; finding a feasible path to a destination based on criteria such as hop length, minimum power required, and life time of wireless link; gathering information about the path breaks; mending the broken paths expending minimum processing power and bandwidth; and utilizing minimum bandwidth.

8. **Define bandwidth constrain in Ad hoc wireless networks? (Remembering)(CO4)**

The channel is shared by all nodes in the broadcast region (any region in which all nodes can hear all other nodes), the band width available per wireless link depends on the number of nodes and the traffic handle. Thus only a fraction of the total bandwidth is available for every node.

9. **What is meant by minimum route acquisition delay? (Remembering)(CO4)**

The route acquisition delay for a node that does not have a route to a particular destination node should be as minimal as possible. This delay may vary with the size of the network and the network load.

10. **What is meant by quick route reconfiguration in ad hoc wireless network? (Remembering)(CO4)**

The unpredictable changes in the topology of the network require that the routing protocol be able to quickly perform route reconfiguration in order to handle path breaks and subsequent packet losses.

11. **Define loop-free routing. (Remembering)(CO4)**

This is a fundamental requirement of any routing protocol to avoid unnecessary wastage of network bandwidth. In ad hoc wireless networks, due to the random movement of nodes, transient loops may form in the route thus established. A routing protocol should detect such transient routing loops and take corrective actions

12. **Define security and privacy in Ad hoc wireless networks. (Remembering)(CO4)**

The routing protocol in ad hoc wireless networks must be resilient to threats and vulnerabilities. It must have inbuilt capability to avoid resource consumption, denial-of-service, impersonation, and similar attacks is possible against an ad hoc wireless networks.

13. **Define multicasting. (Remembering)(CO4)**

Multicasting plays an important role in the typical applications of ad hoc wireless networks namely, emergency search and rescue operations and military communication. In such an environment, nodes form groups to carry out certain tasks that require point to multipoint and multipoint to multipoint voice and data communication.

14. **What are the objectives in transport layer protocols? (Remembering)(CO4)**

The main objective of the transport layer protocols include setting up and maintaining end to end connections reliable end to end delivery of data packets, flow control and congestion control.

15. **Define passive and active attacks. (Remembering)(CO4)**

Passive attacks refer to the attempts made by malicious nodes to perceive the nature of activities and to obtain information transacted in the network without disrupting the operation. Active attacks disrupt the operation of the network. Those active attacks that are executed by nodes outside the network are called external attacks.

16. **What is denial of service? (Remembering)(CO4)**

The attack affected by making the network resource unavailable for service to other nodes, either by consuming the bandwidth or by overloading the system, is known as denial of service (DoS).

17. **List out major issues of ad hoc wireless network? (Understanding)(CO4)**

Robustness, Efficiency, Control overhead, Quality of service, efficient group management, Scalability, Security

18. **What is pricing scheme? (Remembering)(CO4)**

Pricing schemes that incorporate service compensation or service reimbursement are required. Ad hoc wireless networks employed for special tasks such as military missions, rescue operations, and law enforcement do not require such pricing schemes, priority scheduling, and call admission control

19. **What is QoS in ad hoc network? (Remembering)(CO4)**

    Quality of service (QoS) is the performance level of service offered by a service provider or a network to the user. QoS provisioning often requires negotiation between the host and the network, resource reservation schemes, priority scheduling, and call admission control.

20. **What are the major activities of ad hoc wireless network? (Remembering)(CO4)**

    One important property that an ad hoc wireless network should exhibit is organizing and maintaining the network by itself. The major activities that an ad hoc wireless network is required to perform for self – organization are neighbor discovery topology organization, and topology reorganization.

21. **What is meant by beacons? (Remembering)(CO4)**

    This may require periodic transmission of short packets named beacons or promiscuous snooping on the channel for detecting activities of neighbors.

22. **What is energy management? (Remembering)(CO4)**

    Energy management is defined as the processes of managing the sources and consumers of energy in a node or in the network as a whole for enhancing the life time of the network. Shaping the energy discharge pattern of a node's battery to enhance the battery life

23. **Classify the energy management? (Remembering)(CO4)**

    - Transmission power management, Battery energy management, Processor power management, Devices power management

24. **Define scalability? (Remembering)(CO4)**

    Even though the number of nodes in ad hoc wireless network does not grow in the same magnitude as today's internet, the operation of a large number of nodes in the ad hoc mode is not far away. Traditional applications such as military, emergency operations and crowd control may not lead to such a big ad hoc wireless network

25. **What are the benefits of deployment considerations over wired networks? (Remembering)(CO4)**

    - Low cost of deployment, Incremental deployment, Short deployment, Reconfigurability, Scenario of deployment

26. **What are the major issues to be considered for a successful ad hoc wireless internet? (Remembering)(CO4)**

    Some of the applications of the ad hoc wireless internet are wireless mesh networks, provisioning of temporary internet services to major conference venues, sport venues, temporary military settlements, battlefields, and broad internet services in rural regions

27. **What are the applications of wireless ad hoc internet? (Remembering)(CO4)**

    - Gateways, Address mobility, Routing, Transport layer protocol, Load balancing, Pricing/billing, Provisioning of security, QoS support, Service, address, and location discovery

BIG QUESTIONS

1. How is the loop-free property in table driven routing protocols. **(Analyzing)(CO4)**
2. Describe a common method used in alleviating the hidden terminal problem at the MAC layer. **(Understanding)(CO4)**
3. List the important issues for multi-hop wireless communication. **(Analyzing)(CO4)**
4. Why power management important for ad hoc wireless network? **(Analyzing)(CO4)**

5. What role does the routing protocol play in the provisioning of qos guarantees for ad hoc wireless network? **(Remembering)(CO4)**
6. List the major advantages of the ad hoc wireless internet. **(Understanding)(CO4)**
7. Differentiate cellular and ad hoc wireless network **(Understanding)(CO4)**
8. Write brief notes on wireless sensor network. **(Remembering)(CO4)**

UNIT-V

1. **What are the issues in designing a MAC Protocol? (Remembering)(CO5)**

i. Bandwidth efficiency, ii.Qos, iii.Synchronization,iv.Hidden and exposed Terminal problem, v.Mobilty of nodes, vi. Distributed nature of central co ordination.

2. How you classify MAC protocols? (Analyzing)(CO5)

i.Contention based protocols, ii.Contention based protocols with reservation mechanism, iii.Contention based protocols with scheduling mechanisms

3. What are the two types of Random access protocols? (Remembering)(CO5)

i. Sender initiated protocols, ii. Receiver initiated protocols

4. What do you mean by reservation mechanisms? (Remembering)(CO5)

Reservation of the resource (Bandwidth), once bandwidth is reserved the node gets exclusive access to the reserved bandwidth.

5. List criteria to classify the MAC protocol. (Analyzing)(CO5)

i. Initiation approach, ii. Time synchronization, iii. Reservation approach.

6. What is back off algorithm? (Remembering)(CO5)

If a packet transmitted by a node is lost, the node uses back off algorithm to back off for a random interval of time before retrying.

7**. What is BTMA? (Remembering)(CO5)**

Busy Tone Multiple Access is the earliest protocols proposed for overcoming the hidden terminal problem. The transmission channel is split into two types, data channel and control channel.

8. What do you mean by contention based protocol? (Remembering)(CO5)

Protocols that aid the nodes in effecting bandwidth reservations, contention occurs only during the resource reservation phase. Once the bandwidth is reserved, the node gets exclusive access to the reserved bandwidth.

9. List the different types of contention based protocols with reservation mechanism. (Remembering)(CO5)

i. Distributed packet reservation multiple access protocol, ii. Collision avoidance time allocation protocol, iii. Hop reservation multiple access protocol, iv. Soft reservation multiple access with priority assignment, v. Five phase reservation protocol, vi. MACA with piggy back reservation.

10. What do you mean by soft reservation? (Remembering)(CO5)

The soft reservation mechanism allows any urgent node, transmitting packets generated by a real time application, to take over the radio resource from another node of a real time application on an demand basis.

11. What is piggy back reservation? (Remembering)(CO5)

MACA with piggy backed reservation is a protocol used to provide real time traffic support in multi hop wireless networks.

12. List the advantages of using directional antennas in MAC protocol?

i.Reduced signal interference, ii. Increase in the system throughput, and improved channel reuse that leads to an increase in the overall capacity of the channel.

13. What is active or passive node?

In a MAC protocol, switching is possible with every antenna or all the antennas, when it uses active antenna then the radiation pattern is similar to that of an Omni-directional antenna.

14. List some other types of MAC protocols. (Remembering)(CO5)

i.Multichannel MAC protocol. ii. Multichannel CSMA MAC protocol, iii. Power control MAC protocol for Ad hoc Networks. iv. Receiver based automates protocol. Inter leaved Carrier sense multiple access protocol.

15. What do you mean by Hidden and Exposed terminal problems? (Remembering)(CO5)

The hidden and exposed terminal problems are unique to wireless networks. The hidden terminal problem refers to the collision of packets at a receiving node due to the simultaneous transmission of those nodes that are not within the transmission range of the sender, but are within the transmission range of the receiver.

16. Define mobility of nodes. (Remembering)(CO5)

Nodes in adhoc wireless networks are mobile most of the time. The bandwidth reservations made or the control information exchanged may end up being of no use if the node mobility of the nodes.

17. What are synchronous protocols? (Remembering)(CO5)

Synchronous protocols require time synchronization among all nodes in the network, so that reservations made by a node are known to other nodes in its neighborhood. Global time synchronization is generally difficult to achieve.

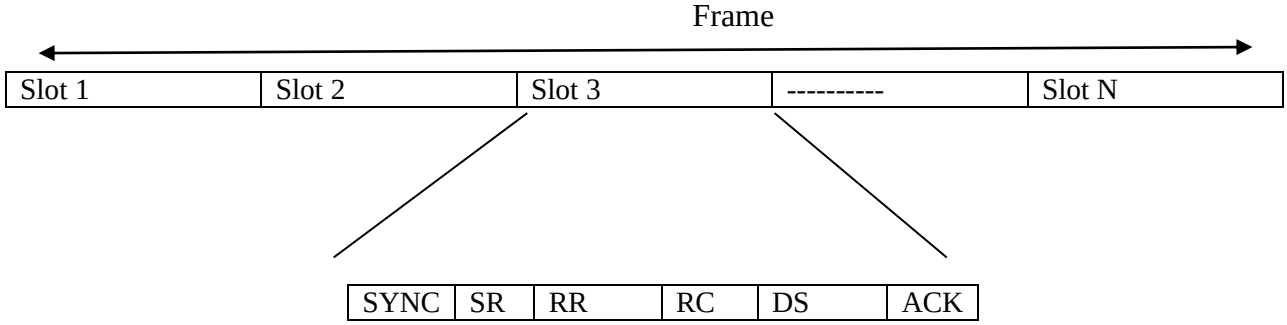
18. What is Asynchronous Protocols? (Remembering)(CO5)

It does not require any global synchronization among nodes in the network. These protocols usually use relative time information for effective reservations.

19. What is FAMA protocol? (Remembering)(CO5)

FAMA- Floor Acquisition Multiple Access Protocols, RTS-CTS exchange with no carrier sensing (ALOHA) and RTS-CTS exchange with non persistent carrier sensing (CSMA)

20. Draw the Frame structure in SRMA/PA. (Remembering)(CO5)



21. What are the five phases in the reservation process? (Remembering)(CO5)

i. Reservation request phase. ii. Collision report phase, iii. Reservation confirmation phase-in. Reservation acknowledgement phase. Packing and elimination phase.

22. What is dead lock condition? (Remembering)(CO5)

When more than two transmitting nodes are located nearby, it results in deadlock condition, Deadlocks are of two types isolated and non isolated.

23. What do you mean by multi hop Co ordination? (Remembering)(CO5)

By means of multi hop Co ordination mechanism, the excess delay incurred by a packet at the upstream nodes is compensated for at the downstream nodes, When a node receives a packet, it would already received the priority index of the packet piggy packed on the previous RTS packet.

BIG QUESTION

1. What are the advantages of reservation based MAC protocols over contention based MAC protocols? **(Remembering)(CO5)**
2. Compare the pros and cons of using scheduling based MAC protocols over reservation based MAC protocols. **(Understanding)(CO5)**
3. What are the disadvantages of the binary exponential back off algorithm used in MACA? How are they overcome in MACAW? **(Remembering)(CO5)**
4. Discuss the packet queuing mechanism of MACA. **(Understanding)(CO5)**
5. How synchronization between nodes achieved in the HRMA protocol? **(Analyzing)(CO5)**
6. What are the pros and cons of using multichannel MAC protocols over single channel MAC protocols? **(Remembering)(CO5)**

7. What are the advantages and disadvantages of MAC protocols using directional antennas? **(Remembering)(CO5)**