Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Computer Science and Engineering

Continuous Assessment Test – I

Answer key

Degree & Branch	B.E – Computer Science and Engineering				Semester	VII
Subject Code & Name	UCS1702- MOBILE COMPUTING				Regulation	2018
Academic Year	2023-2024 ODD	Batch	2020-2024	Date	06.09.2023	FN
Time: 08:10- 09:40 AM (90 Minutes)	Answer All Questions				Maximum: 50 Marks	

Part – A (6×2 = 12 Marks)

1. Why is datalink layer in IEEE 802.11 is subdivided? What are its sublayers?

The datalink layer in IEEE 802.11 is subdivided into two sublayers:

- **Logical Link Control (LLC)**: The LLC sublayer provides a common interface between the datalink layer and the network layer. It is responsible for providing services such as error detection and correction, flow control, and multiplexing of data from multiple network layer protocols.
- **Media Access Control (MAC)**: The MAC sublayer is responsible for controlling access to the physical medium. It does this by arbitrating between multiple devices that want to transmit data on the same medium.

The IEEE 802.11 standard uses the same LLC sublayer as other IEEE 802 standards, such as Ethernet. This allows for interoperability between wireless and wired devices. The MAC sublayer is unique to IEEE 802.11 and is responsible for the specific details of how devices access the wireless medium.

2. Compare wired networks and ad-hoc networks.

Feature	Wired Network	Ad-hoc Network
Physical medium	Cables	Wireless
Topology	Star, bus, ring, mesh	Ad hoc (peer-to-peer)
Connectivity	Fixed	Dynamic
Security	More secure	Less secure
Cost	More expensive	Less expensive
Scalability	More scalable	Less scalable
Reliability	More reliable	Less reliable
Deployment	More difficult	Easier

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

CSMA/CD cannot be used in wireless networks for the following reasons:

- **Hidden node problem:** In a wireless network, a node cannot always hear all of the other nodes. This is because the signal strength of a wireless signal decreases with distance. This can lead to a

situation where two nodes, A and B, can both hear the access point, but they cannot hear each other. If A starts transmitting data, B will not know and may start transmitting data as well. This will cause a collision.

- **Exposed node problem:** In a wireless network, a node may be able to hear a transmission from another node, but it may not be able to transmit to that node. This is because the signal strength of a wireless signal is also affected by obstacles. This can lead to a situation where a node, C, can hear a transmission from node A, but it cannot transmit to node A because there is an obstacle in the way. If node C starts transmitting data, it will cause a collision with node A's transmission.

To overcome these problems, wireless networks use a different MAC protocol called CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance).

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4. Explain Code Division Multiple Access (CDMA).

Code Division Multiple Access (CDMA) is a channel access method used by various radio communication technologies. CDMA is an example of multiple access, where several transmitters can send information simultaneously over a single communication channel. This allows several users to share a band of frequencies. CDMA employs spread spectrum technology and a special coding scheme (where each transmitter is assigned a code).

In spread spectrum technology, the data signal is spread over a wider frequency range by multiplying it with a pseudorandom code. This makes the signal less susceptible to interference from other signals and allows multiple signals to be transmitted over the same frequency band without interfering with each other.

The coding scheme in CDMA assigns a unique code to each transmitter. This code is used to spread the data signal and also to demodulate the signal at the receiver. The receiver uses the same code as the transmitter to despread the signal and recover the original data.

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5. Outline how packet is delivered from a Mobile Node (MN) to a fixed node / Correspondent Node (CN).
   Ans : Step 4

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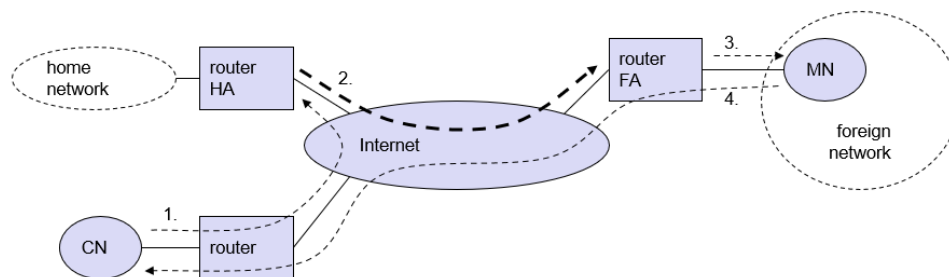
6. What are the two possibilities for the location of the Care-of Address (COA)?
   2 types of COA
   a. Foreign Agent COA
      i. Usually the IP address of the FA
      ii. Many MN using FA can share COA as common COA
      iii. FA is the tunnel end point, and FA forwards packet to the MN
   b. Co-Located COA
      i. When the MN temporarily acquires an additional IP address, that acts as the COA.
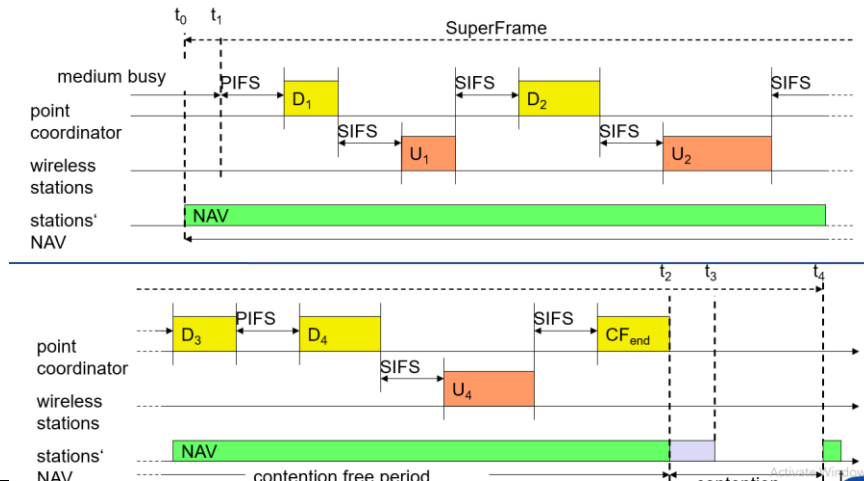   MN is the tunnel end point.

Part – B (3×6 = 18 Marks)

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7. Illustrate how does DFWMAC- PCF with polling enhance wireless communication in terms of network efficiency and collision reduction.

DFWMAC-PCF with polling

- Using PCF requires an access point that controls medium access and polls the single nodes.
- Adhoc networks cannot use this function so, provide no QoS but best effort in IEEE 802.11 WLANs.
- The point coordinator in the access point splits the access time into superframe periods.
- A superframe comprises a contention-free period and a contention period.
- The contention period can be used for the two access mechanisms presented above.

8. Compare SDMA, FDMA, TDMA and CDMA.

Approach	SDMA	TDMA	FDMA	CDMA
Idea	segment space into cells/sectors	segment sending time into disjoint time-slots, demand driven or fixed patterns	segment the frequency band into disjoint sub-bands	spread the spectrum using orthogonal codes
Terminals	only one terminal can be active in one cell/one sector	all terminals are active for short periods of time on the same frequency	every terminal has its own frequency, uninterrupted	all terminals can be active at the same place at the same moment, uninterrupted
Signal separation	cell structure, directed antennas	synchronization in the time domain	filtering in the frequency domain	code plus special receivers
Advantages	very simple, increases capacity per km²	established, fully digital, flexible	simple, established, robust	flexible, less frequency planning needed, soft handover
Dis-advantages	inflexible, antennas typically fixed	guard space needed (multipath propagation), synchronization difficult	inflexible, frequencies are a scarce resource	complex receivers, needs more complicated power control for senders
Comment	only in combination with TDMA, FDMA or CDMA useful	standard in fixed networks, together with FDMA/SDMA used in many mobile networks	typically combined with TDMA (frequency hopping patterns) and SDMA (frequency reuse)	still faces some problems, higher complexity, lowered expectations; will be integrated with TDMA/FDMA

9. Imagine a Wi-Fi network with multiple devices contending for access to the wireless channel. A device wants to transmit data, and there are other devices in the network. The spread spectrum followed by the station is frequency hopping. Make use of this spread spectrum and calculate SIFS, PIFS, and DIFS considering the time slot value of 20µs.

Ans:

- FHSS, slot time= 20µs
- SIFS =28 µs
- PIFS = SIFS +Slot Time =48 µs
- DIFS = SIFS +2 x Slot Time = 68 µs

10. Consider a public Wi-Fi in a busy coffee shop. To ensure fair and efficient access to the internet for all users, the Wi-Fi employs a "Multiple Access with Collision Avoidance" mechanism. How does this mechanism function to provide seamless internet connectivity to multiple users simultaneously? Identify the protocols used to prevent data collisions.
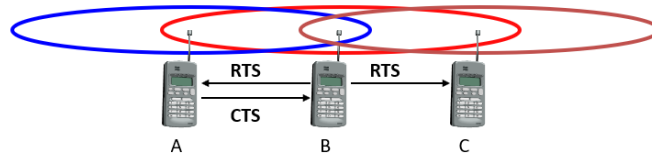
- MACA avoids the problem of hidden terminals
    - A and C want to send to B
    - A sends RTS first
    - C waits after receiving CTS from B
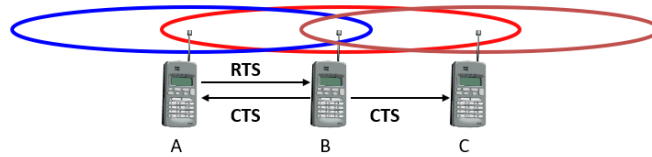
- MACA avoids the problem of exposed terminals
   - B wants to send to A, C to another terminal
   - now C does not have to wait for it cannot receive CTS from A

(OR)

11. You are the network administrator for a large enterprise. You have a wireless LAN with hundreds of access points and thousands of wireless devices. You are concerned about the high power consumption of the wireless network. Solve the problem of power consumption in your wireless network by implementing a power management solution.

Power saving with wake-up patterns (infrastructure)
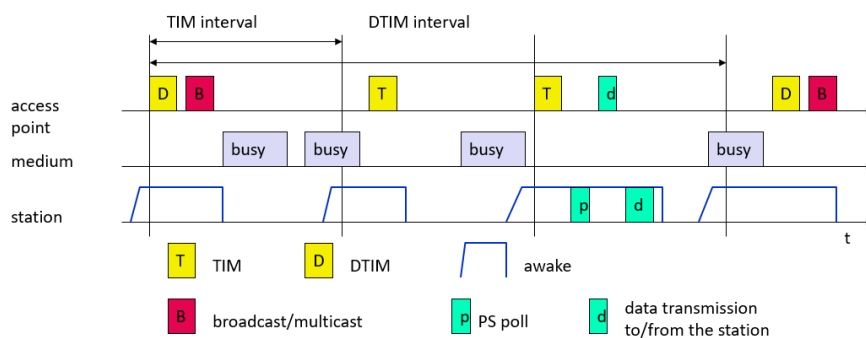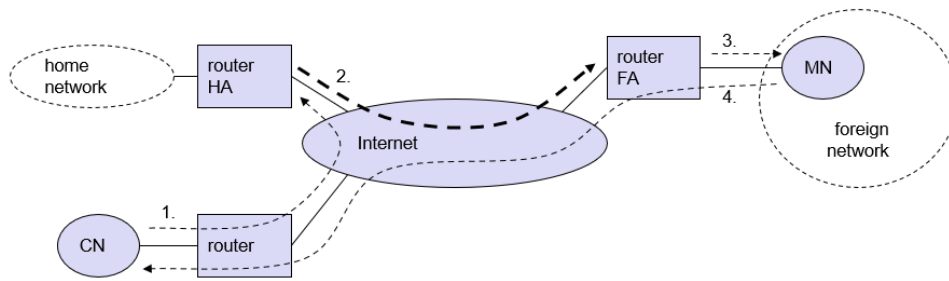

Power saving with wake-up patterns (ad-hoc)
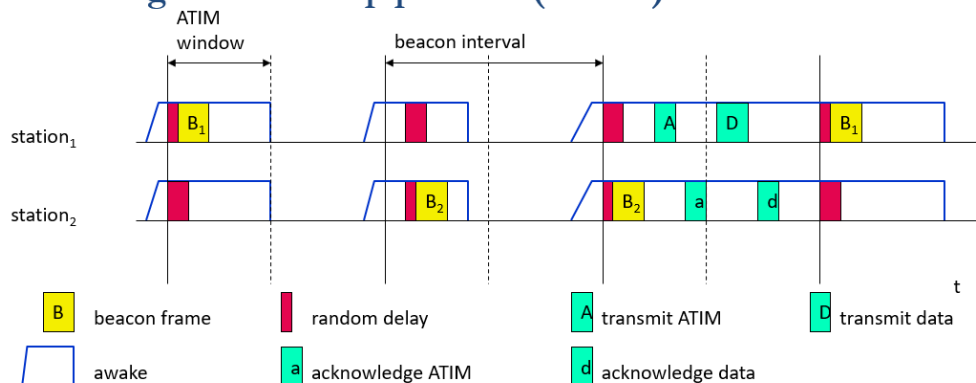
12. List the entities of mobile IP. Make use of these entities to describe data transfer from a mobile node to a fixed node and vice versa. Why and where encapsulation is needed?

Ans: All entities – explain
- Data Transfer to the Mobile Node
- Data Transfer from the Mobile Node

Step 1-3, 4

(OR)

13.   Identify how tunnelling works in general. Apply this concept for mobile IP and explain how IP-in-IP, minimal, and generic routing encapsulation works. Discuss the advantages and disadvantages of these three methods.