SNS COLLEGE OF TECHNOLOGY
COIMBATORE-35
DEPARTMENT OF ECE

QUESTION BANK

Name of the Subject : AD HOC AND SENSOR NETWORKS **Subject Code : 19ECE402**

Semester : VII **Year : IV ECE**

PART A

1. What is handoff ? [NOVEMBER/DECEMBER 2016]

The handover or handoff refers to the process of transferring an ongoing call or data session from one channel connected to the core network to another channel.

2. What is multicasting? [NOVEMBER/DECEMBER 2016]

In computer networking, multicast (one-to-many or many-to-many distribution is group communication where information is addressed to a group of destination computers simultaneously. Group communication may either be application layer multicast or network assisted multicast, where the latter makes it possible for the source to efficiently send to the group in a single transmission. Copies are automatically created in other network elements, such as routers, switches and cellular network base stations, but only to network segments that currently contain members of the group.

3. Define a wireless sensor network. [APRIL/MAY 2017]

Wireless sensor network (**WSN**) refers to a group of spatially dispersed and dedicated sensors for monitoring and recording the physical conditions of the environment and organizing the collected data at a central location. WSNs measure environmental conditions like temperature, sound, pollution levels, humidity, wind, and so on.

4. State the difference between Cellular Network and Ad Hoc Wireless Network. [APRIL/MAY 2017]

Cellular Network	Ad Hoc Wireless Network
It is infrastructure based network	Infrastructure less
Single Hop wireless link	Multi hop wireless link
Guaranteed Bandwidth for Voice	Shared radio channel
Circuit switched	Packet switched
Infrequent path break	Frequent path break

5. State Shannon's theorem. [NOVEMBER/DECEMBER 2017]

The Shannon–Hartley theorem tells the maximum rate at which information can be transmitted over a communications channel of a specified bandwidth in the presence of noise.The maximum data rate (C) on noisy channel is

$$C = B \log_2 (1 + S / N) \text{ bits/sec}$$

Where B – bandwidth, S – Signal power and N – Noise power in decibels

6.What is fading? List the different types of fading. [NOVEMBER/DECEMBER 2017]

Fading refers to the fluctuations in signal strength when received by the receiver. This can be classified into two categories.

- Fast fading (small-scale fading)
- Slow fading (large-scale fading)

7. Compare fast fading and slow fading. [APRIL/MAY 2018]

Fading refers to the fluctuations in signal strength when received by the receiver. This can be classified into two categories.

Fast fading	Slow fading
It is a small scale fading.	It is large scale fading.
High Doppler Spread	Low Doppler Spread
It occurs for very low data rates	It occurs for very high data rates

8.List any three radio waves propagation mechanism. [APRIL/MAY 2018]

- Reflection
- Diffraction
- Scattering

9. Define the term: Internet Protocol (IP). [NOVEMBER/DECEMBER 2018]

The **Internet Protocol** (**IP**) is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries. Its routing function enables internetworking, and essentially establishes the Internet.

10.Differentiate between WSNs and MANETs. [NOVEMBER/DECEMBER 2018]

Wireless Sensor Network

• WSN is a network which is made of large number of sensor nodes known as sensor motes. This nodes are self directed and low powered devices.
• These nodes collect, process and convey the data to users.
• The WSN nodes perform less computing and processing.
• The nodes are energy efficient.
• WSN need infrastructure and has large number of nodes in hundreds or thousands.

Ad hoc Network

Ad hoc network do not require any infrastructure and has less number of nodes. Following table mentions features of Ad hoc network and mentions difference between wireless sensor network(WSN) and Ad Hoc network types.

Feature	Wireless Sensor Network	Ad hoc Network
Number of sensor nodes or motes	Large in quantity	Medium in quantity
Deployment type	Very much dense	Scattered

Rate of failure	More	Very rare
Change in network topology	frequency	Rare
Communication mode	Broadcast	point to point
Battery	Not replaceable / Not rechargeable	Replaceable
Identifiers (IDs) used in the network	No unique IDs	Unique IDs
Centric mode	based on data	based on address
Fusion/Aggregation	Possible	Not suitable
Computational capacities & memory requirement	Limited	Not limited
Data rate support provided	Lower	Higher
Redundancy	High	Low

1. Define computer network and give its two components.

A computer network is an interconnected collection of independent computers which consists of two components

Distributed applications
Networking infrastructure

2. Give some example of distributed applications.

- Internet
- E-mail
- Banking applications
- Reservation system

3. List the high and low frequency bands in the electromagnetic spectrum.

- High frequency bands X-rays and Gamma rays
- Low frequency bands-radio, Microwave, infrared and visible waves.

4. What are the method of spectrum allocation

Comparative bidding
Lottery system
Auctioning method

5. What is multipath propagation? How it affect the signal quality?

Multi path is the propagation phenomenon that results in radio signals reaching the receiving antenna by two or more paths. The effects of multipath include constructive and destructive interference, and phase shifting of the signal. Multi path propagation of signals causes fading of the transmitted signal.

6. What is inter symbol interference? Give a mechanism that is used for overcoming problems arising due to inter symbol interference.

Inter symbol interference is a type of interference, where distortion in the received signal is caused by the temporal spreading and the consequently overlapping of individual pulses in the signal. It can be avoided by introducing guard bands.

7. List the characteristics of the wireless Channel.

- Path loss
- Fading
- Interference
- Doppler shift
- Transmission rate constraints.

8. Define fading.

Fading is fluctuations in signal strength when received at the receiver.It has two types,

- Fast fading or small scale fading
- slow fading or large scale fading.

9. Explain the Doppler shift.

It is defined as change in the frequency of the received signal when the transmitter and receiver move with respect to each other.

The Doppler shift is given by $fd=v/\lambda$

10. List some of the applications of ad hoc wireless networks.

- Military application
- Collaborative and distributed computing
- Emergency operation
- Wireless mesh networks
- Wireless sensor networks

11. What are the objectives of transport layer protocol? Which protocols are used?

- Setting up and maintaining end-to-end connections
- Reliable end-to end delivery of data packets
- Flow control
- Congestion control

12. Define QoS

QoS is closely related to the type of network service is the quality of that service which is the amount and quality of information that can be extracted at given sinks avout the observed objects or area. Therefore adapted quality concepts like reliable detection of events or the approximation quality.

13What is fault tolerance?

Some sensor nodes may fail or be blocked due to lack of power or have physical damage or environmental interference. The failure of sensor nodes should not affect the overall task of the sensor network. This is the reliability or fault tolerance issue.

UNIT II

MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS

PART A

1. **How single-channel sender initiated contention based MAC protocols for Ad Hoc Wireless Networks work? [NOVEMBER/DECEMBER 2016]**

In sender-initiated protocols, the packet transmissions are initiated by the sender nodes only. In Single-channel sender-initiated protocols, the total available bandwidth will not be divided into several channels; it will be used as it is. The node which uses the channel can use entire bandwidth and hence only one node can able to transmit data and use the channel at a time.

2. **Outline how node scheduling is done in contention-based MAC protocols with scheduling mechanism. [NOVEMBER/DECEMBER 2016]**

Contention-based MAC protocols with scheduling mechanisms perform two operations: Packet scheduling at each node and scheduling nodes for accessing channel. Scheduling mechanism has to consider the priority assigned for each flow and the battery power of each node. The scheduling decisions need to consider the following factors.

- Delay targets of packets
- Laxities of packets
- Traffic load at nodes
- Remaining battery power at node

3.**Define Packet Delivery Ratio. [APRIL/MAY 2017]**

Packet delivery ratio is defined as the ***ratio*** of data ***packets*** received by the destinations to those generated by the sources. Mathematically, it can be defined as:

PDR = S1 / S2

Where, S1 is the sum of data ***packets*** received by the each destination and S2 is the sum of data ***packets*** generated by the each source.

4. What is contention based protocol? [APRIL/MAY 2017]

Contention-based MAC protocols do not make any bandwidth reservations. Instead, each node may compete for shared channel. The node which capture the channel is called winning node. The winning node can able to access the shared media and start to transmit the packets. The protocols which use the mechanisms are

- MACAW
- Floor acquition Multiple Access protocols
- Busy tone Multiple Access protocols

5. Write down the issues of designing a MAC protocol for Ad-hoc networks. [NOVEMBER/DECEMBER 2017]

- Bandwidth efficiency
- QoS support
- Synchronization
- Hidden and Exposed terminal problems
- Error prone shared broadcast channel

6. How mobility of nodes affect the throughput in wireless networks? [APRIL/MAY 2018]

The mobility of nodes would affect the performance of the system in Ah Hoc wireless network. Due to the mobility of nodes, channel reservation and the node information cannot be periodically maintained. So the throughput of the network is highly reduced.

7.How does Multi-hop coordination mechanism work? [APRIL/MAY 2018]

Each node will forward the message through multiple hops to deliver to the designated nodes which is far away to source node.

8.What is meant by Internet Proxy? [NOVEMBER/DECEMBER 2018]

A proxy server, also known as a **"proxy" or "application-level gateway",** is a computer that acts as a gateway between a local network and a larger-scale network such as the internet. Proxy servers provide increased performance and security.

A proxy server works by **intercepting connections** between sender and receiver. All incoming data enters through one port and is forwarded to the rest of the network via another port. By blocking direct access between two networks, proxy servers make it much more difficult for hackers to get internal addresses and details of a private network.

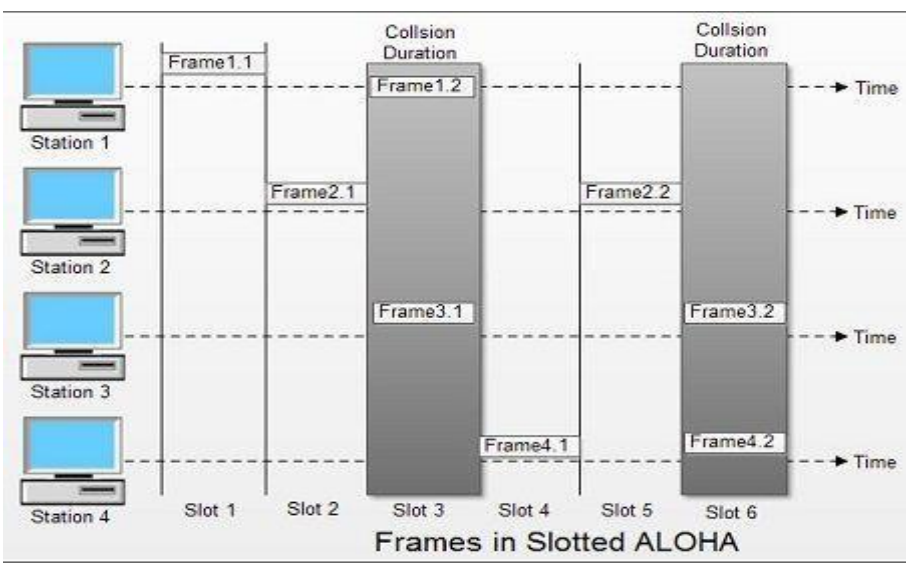
9.What is Slotted ALOHA ? [NOVEMBER/DECEMBER 2018]

Slotted ALOHA

• Slotted ALOHA was invented to improve the efficiency of pure ALOHA as chances of collision in pure ALOHA are very high.

• In slotted ALOHA, the time of the shared channel is divided into discrete intervals called slots.

• The stations can send a frame only at the beginning of the slot and only one frame is sent in each slot.



• In slotted ALOHA, if any station is not able to place the frame onto the channel at the beginning of the slot *i.e.* it misses the time slot then the station has to wait until the beginning of the next time slot.

• In slotted ALOHA, there is still a possibility of collision if two stations try to send at the beginning of the same time slot as shown in fig.

• Slotted ALOHA still has an edge over pure ALOHA as chances of collision are reduced to one-half

1. **Describe the common method used in alleviating the hidden terminal problem at the MAC layer.**

Hidden terminals are nodes that are hidden from the sender of a data transmission but are reachable to the receiver of the session. In such cases, the hidden terminal can cause collision at the receiver node. The presence of hidden problem 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.

2. List the major issues in MAC protocol for ad hoc wireless networks o Bandwidth efficiency
- o QoS support
- o Synchronization
- o Hidden and exposed terminal problems o Error prone shared broadcast channel

3. **List the classification of MAC protocol?**
- o Contention based protocols
- o Contention based protocol with reservation mechanisms
- o Contention based protocols with scheduling mechanisms

4. **What are the advantages of reservation based MAC protocols over contention based MAC protocols?**
- o MACA/PR is an efficient bandwidth reservation protocol that can support real time traffic sessions
- o MACA/PR is that it does not require global synchronization among nodes o RTMAC is its bandwidth efficiency
- o RTMAC is its asynchronous mode of operation where nodes do not require any global time synchronization

5. **What are the advantages of the BTMA protocol ?How are they overcome in the DBTMA protocol?**

The probability of collision is very low in BTMA, the bandwidth utilization is very poor. DBTMA exhibits better network utilization. This is because the other schemes block both the forward and reserve transmission on data channel when they reserve the channel through their RTS and CTS packets

6. **List out the five phase of the reservation protocol.**

Reservation request phase
Collision report phase
Reservation conformation phase
Reservation acknowledgement phase
Packing and eliminating

7. **List the services provided by IEEE802.11 services.**

- Association
- Authentication
- De-Authentication
- Disassociation
- Integration
- Data delivery
- Privacy
- Reassociation

8. **What are the pros and cons of using multichannel MAC protocol over a single channel protocol?**

Although several single channel schemes came into design and tried to achieve a high quality of services scheme, most of them were not successful due to hidden and exposed terminal problems and the fairness issue. On the other hand, the multichannel schemes were almost successful in solving these problems and providing a better and more reliable MAC protocol for the users.

9. **How is synchronization between nodes achived in HRMA protocol?**

HRMA uses a dedicated frequency channel for synchronization where nodes exchange synchronization information .When a node wants to sent data it listens to the HOP reservation period. If there is a packet there, it tries again after a random amount of time, otherwise it sends a RTS packet, and waits for the CTS acknowledgement packet in the CTS period of the corresponding frequency channel.

10. **Write the difference between HRMA and SRMA**

HRMA uses a reservation and handshake mechanism to enable a pair of communicating nodes to reserve a frequency hop which guarantees collision free data transmission even in the presence of hidden terminal problem. Each time slot is assigned a separate frequency channel.

SRMA uses collision avoidance handshake mechanism and soft reservation mechanism in order to contend for and effect reservation of time slots. Nodes are allocated different time slots so that the transmission are collision free.

11. **Write short notes on D-PRMA**

D-PRMA was developed to provide voice support in ad hoc wireless networks.it is more suited for voice traffic than for data traffic applications. Nodes are prioritized to transmit voice traffic over normal data traffic.

12. Which protocol is more bandwidth efficient RTMAC or MACA/PR?

RTMAC uses bandwidth efficiently than MACA/PR. MACA/PR has the possibility of having fragmented free slots not being used at all which reduces bandwidth efficiency whereas in RTMAC, the free slots may occur in between the reservation slots.

13. Define preferable channel List(PCL)

PCL is a data structure maintained by each node in multichannel MAC protocol. It maintains the usage of channel within the transmission range of the node. The nodes that hear ATIM-ACK and ATIM-RES packets update their PCLs accordingly.

14. Narrate the role of channels in ICSMA

The total available bandwidth is split into two equal channels in ICSMA. If the source node transmits the RTS packet on one channel and if the receiver node is ready to accept packets from the sender, it responds by transmitting the CTS packet on another channel.

15. Define priority index.

Priority index of a packet is defined as the ratio between packet delivery ratio to the desire packet delivery ratio for the flow multiplied by the uniform laxity budget of the packet.

PI=(PDR/M) X ULB

16. What are the basic principles of CATA?

The receiver of a flow must inform the potential source nodes about the reserved slot on which it is currently receiving packets.

Usage of negative acknowledgement for reservation request and control packet transmission at the beginning of each slot, for distributing slot reservation information to sender of broadcast sessions.

17. Differentiate MACA-BI and MARCH

MACA-BI eliminates the need for RTS packet and data transmission occurs through a two way handshake mechanism and it uses a traffic prediction mechanism. The hidden terminal problem is overcome in MACA-BI and collision among data packets is less.

In MARCH the RTS is used only for the first packet of the stream. It does not require any traffic prediction mechanism and reduce the number of handshakes involved in data transmission .The throughput and average end to end delay is very low in MARCH when compared to MACA.

UNIT-III

ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS

PART A

1. How the table-driven routing protocols work in Ad hoc networks? [NOVEMBER/DECEMBER 2016]

In table-driven routing protocol, each node maintains a routing table. Routing table contains up-to-date routing information of the entire network. Whenever a node wants to send a packet to the receive node, it looks up its own routing table to find the routing path from itself to the intended received. These routing tables have to be updated periodically to maintain the current stable or paths.

2.List the major functions performed by the TCP[NOVEMBER/DECEMBER 2016].

- Addressing/Multiplexing
- Connection Establishment, Management and Termination
- Data Handling and Packaging
- Data Transfer
- Providing Reliability and Transmission Quality Services
- Providing Flow Control and Congestion Avoidance Features

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4.What is hybrid routing? [APRIL/MAY 2017]

Hybrid Routing Protocolis a network routing protocolthat combines Distance Vector Routing Protocol and Link state Routing Protocol features.It is used to determine optimal network destination routes and report network topology data modifications.

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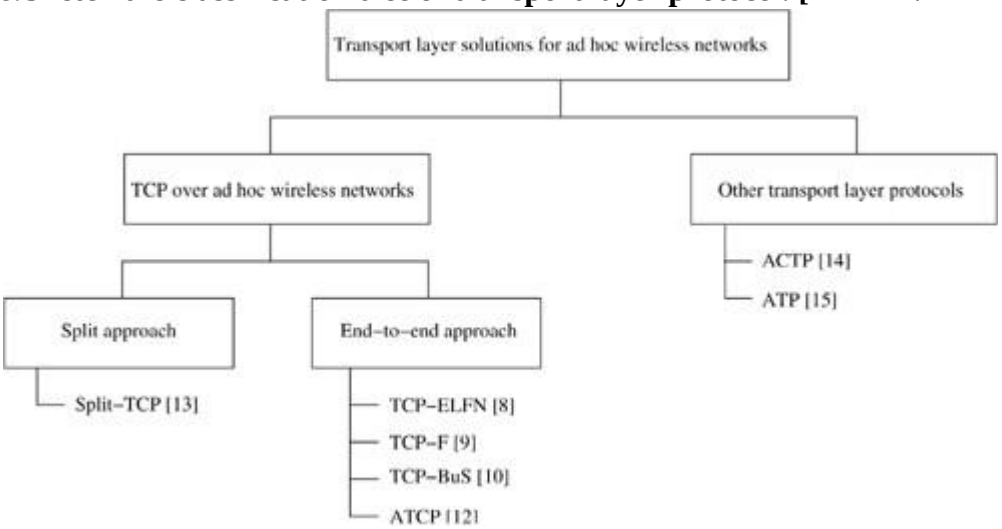
6.Write down the difference between Proactive routing and Reactive routing. [NOVEMBER/DECEMBER 2017]

Proactive Routing	Reactive Routing
It is a table driven routing protocol.	It is a on-demand routing protocol.
It is not suitable for large network.	It is suitable for large network.
Network overload is high.	Network overload is low.
Example protocols are DSDV, WRP, CGSR , FSR, etc.	Example protocols are DSR, AODV, TORA, LAR, etc.

7. Differentiate intra-zone and inter-zone routing protocol in Hybrid routing. [APRIL/MAY 2018] Intra-zone routing protocol is used when the nodes use proactive routing whereas Inter-zone routing protocol can be used by the node when it uses reactive routing

8. Sketch the classification tree of transport layer protocol. [APRIL/MAY 2018]



9. What is the need for Routing Protocols? [NOVEMBER/DECEMBER 2018]

An ad hoc routing protocol is a convention, or standard, that controls how nodes decide which way to route packets between computing devices in a mobile ad hoc network.
In ad hoc networks, nodes are not familiar with the topology of their networks. Instead, they have to discover it: typically, a new node announces its presence and listens for announcements broadcast by its neighbors. Each node learns about others nearby and how to reach them, and may announce that it too can reach them.

10. Mention the QOS Parameters. [NOVEMBER/DECEMBER 2018]

The main three parameters for QoS are latency 2 (delay), jitter and loss. Delay is the total amount of time a network spends to deliver a frame of data from source to destination. Jitter in turn is the delay between two consecutive packets in that frame. While loss determines the maximum amount of packets loss the stream can tolerate to provide good quality. Each parameter has been investigated thoroughly and many solutions are proposed such as forward error correction and interleaving .Other QoS parameters include reliability, network availability and bandwidth.

1. **Define Routing**

   Routing is the process of selecting best paths in a network. In the past, the term routing was also used to mean forwarding network traffic among networks. Routing is performed for many kinds of networks, including the telephone network , electronic data networks and transportation networks.

2. **How is the loop free property ensured in on demand routing protocol?**

   It 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.

3. **What are the advantages of hierarchical routing protocol?**
   - Reduction in the size of routing tables
   - Better scalability
   - Substantially lesser calculation and updates of routing tables

4. **List some example of table driven routing protocols**
   - Destination sequential distance-vector routing
   - Wireless routing protocol
   - Cluster head gateway switch routing protocol
   - Source tree adaptive routing protocol
5. **List the advantages of DSVL routing protocols**
   - The routers are readily available to all destination at all times, the delay is less in the route setup process.
   - With the help of mechanism like incremental updates, an existing wired network protocol can be applied to ad hoc wireless networks
6. **What is hybrid routing protocol?**

   Hybrid routing protocol combines the best feature of proactive and reactive routing protocols. Hybrid routing protocol use distance vector for more accurate metrics to determine the best paths to designation network and report routing information only when there is a change in the topology of the network.
7. **How is the cluster head selected in the CGSR protocol?**

   CGSR organizes nodes into cluster with coordination among the members of each cluster assigned to a unique node called cluster-head. The cluster head is selected dynamically by using a least cluster change algorithm. In LCC algorithm, a node ceases to be a cluster head only if it comes under the range of another cluster-head, where tie is broken either using the lowest ID or highest connectivity algorithm.
8. **What are the major challenges in designing routing protocols?**
   - Mobility
   - Bandwidth constraint
   - Error prone shared broadcast radio channel
   - Hidden and exposed terminal problems
9. **List some of the characteristics of a routing protocol for ad hoc wireless networks.**
   - It must be fully distributed
   - It must be localized and adaptive to frequent topology changes
   - It must provide Quality of service
   - It must use the resources efficiently
10. **What is the approach used to find link stability in ABR?**

    A link is classified as stable or unstable based on its temporal stability. The temporal stability is determined by counting the periodic beacons that a node receives from its neighbors. Each node maintains the count of its neighbors beacons and classifies each link as stable or unstable based on the beacon count.
11. **Classify the routing protocol for ad hoc wireless network**
    - Routing information update mechanism
    - Use of temporal information for routing
    - Topology information organization
    - Utilization of specific resources
12. **Based on routing information update mechanism how the routing protocols are classified?**
    - Proactive or table driven routing protocol
    - Reactive or on demand routing protocol
    - Hybrid routing protocol

13. Give the major objectives of the transport layer protocol.

- Setting up of an end-to-end connection
- End-to-end delivery of data packets
- Flow control
- Congestion control

14. Why does TCP not work well in Ad hoc network?

- Misinterpretation of packet loss
- Frequent path breaks
- Effect of path length
- Uni-directional path
- Multipath routing
- Network partitioning and remerging.

15. List the issues in designing a transport layer protocol for ad hoc wireless networks

- Induced traffic
- Induces throughput unfairness
- Separation of congestion control, reliability and flow control
- Power and bandwidth constraints
- Dynamic topology

16. Specify some of the goals to be achieved in transport layer protocol for ad hoc wireless networks.

- The throughput for each connection should be increased
- Throughput fairness must be provided across contending flows
- The connection setup and connection maintenance overhead should be minimal
- The protocol should have congestion control and flow control mechanism in the network.
- The protocol should be able to adjust to the dynamic topological changes in the network

17. What additional state information is to be maintained at the FP in TCP-F?

The state information that is maintained at the FP in TCP-F is

Snooze state

Connected state

18. What is the impact of the failure of proxy nodes in split –TCP?

The failure of proxy nodes in splits TCP leads to throughput degradation. During frequent path breaks or during frequent node failure, the performance of split TCP may be affected.

19. How table driven routing protocols for ad hoc networks work?

Proactive protocols, which are also know as table-driven protocols, maintain all the time routing information for all known destinations at every source. In these protocols nodes exchange route information periodically and / or in response to topology change.

20. List the functions performed by TCP.

- Addressing/Multiplexing
- Connection Establishment, Management and Termination
- Data Handling and Packaging
- Data Transfer
- Providing Reliability and Transmission Quality Services
- Providing Flow Control and Congestion Avoidance Features

UNIT-IV

WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS

PART A

1. **Outline the functions performed by a node in a wireless sensor network. [NOVEMBER/DECEMBER 2016]**

   Sensor node can perform the following functions. They are

i)	Wireless communication	(ii)	Single processing
iii)	Topology management	(iv)	Self assembling
v)	Routing	(vi)	Clustering
vi)	Scheduling	(viii)	Digital Encoding
ix)	Error correction	(x)	Storage of data

2.How CSMA based MAC work on Wireless Sensor Network?[NOVEMBER/DECEMBER 2016]

In CSMA-based MAC protocols, each sensor node uses constant period to contend channels; but back-off wait time can be random in order to eliminate repetitive collisions. An Adaptive Transmission Rate Control(ARC) is used to balance the traffic between sensor nodes using linear increase and multiplicative decrease method for initiative traffic in a node.

3.List the components of a sensor node. [APRIL/MAY 2017]

Hardware Components	Software Components
Sensing Unit	Operating System Microcode
Communication Unit	Sensor Driver Program
Processing Unit	Communication processor and drivers
Power Supply Unit	Data processing mini-apps

4. Define data relaying in a WSN ? [APRIL/MAY 2017]

Data relaying is the process of transferring routing queries or data through sensor nodes to intended recipient in sensor network. The sensor nodes gather data from different nodes and forward it to the fixed station or to other nodes for further processing.

5. List out the hardware and software components of a sensor node. [NOVEMBER/DECEMBER 2017]

Hardware Components	Software Components
Sensing Unit	Operating System Microcode
Communication Unit	Sensor Driver Program
Processing Unit	Communication processor and drivers
Power Supply Unit	Data processing mini-apps

6.Write down the various operational states of transceiver in WSN. [NOVEMBER/DECEMBER 2017]

- Transmit
- Receive
- Idle
- Sleep

7.List some design challenges posed by sensor networks. [APRIL/MAY 2018]

- Types of sensor Power consumption
- Environment in which sensor node is working
- Computational capability Sensing capability
- Connectivity Control of remote devices

8.What is data aggregation strategy in Wireless Sensor Network? [APRIL/MAY 2018]/ [APRIL/MAY 2017]

Sensor nodes are resource constrained and possess limited battery. So to avoid the usage of more resources and battery power, data sensed by sensor nodes must be aggregated and disseminated to other nodes. Data aggregation is the process of collecting data from different sensor nodes and combining it together by applying aggregate functions. Data aggregation strategies are used to enhance the network lifetime.

9.What is Sensor Network Localization ? [NOVEMBER/DECEMBER 2018]

1. **What is WSN?**

   Wireless sensor networks are a network that consists of sensor which are distributed in an ad hoc manner.

2. **Compare wireless sensor network with ad hoc network**
   - Wireless sensor network mainly use broadcast communication while ad hoc networks use point-to-point communication.
   - Unlike ad hoc networks wireless sensor networks are limited by sensors limited power , energy and computational capability,
   - Sensor nodes may not have global ID because of the large amount of overhead and large number of sensors.
3. **List the advantages of clustering**
   - Prevent interferences using CDMA
   - Flexible and adaptive
   - Efficient transmission using TDMA
4. **List the disadvantages of clustering**
   - Cluster head formation more overhead
   - Long distance for CH to travel
   - Possibility of CH dead
5. **What are the disadvantages of flooding?**
   - Implosion
   - Overlap
   - Resource blindness
6. **What is sequential assignment routing?**

   The sequential assignment routing algorithm creates multiple trees, where the root of each tree is a one hop neighbor of the sink.

7. **What is data aggregation?**

   Data aggregation is the process of collecting and aggregating the useful data. It is considered as one of the fundamental processing procedures for saving the energy.

8. **What are the challenges caused by sensor network MAC protocol?**
   - No single controlling authority, so global synchronization is difficult
   - Power efficiency issue
   - Frequent changes in topology due to node mobility and failure.

9. What are three kinds of MAC protocols used in sensor network?

- fixed -allocation
- demand- based
- contention –based

10. List the IEEE 802.15.4 features

- Data rates of 250kbps, 40kbps and 20kbps
- Two addressing modes; 16 bit short and 64 bit IEEE addressing
- CSMA-CA channel access
- Automatic network establishment by the coordinator.

11. How an implosion is caused?

When duplicate messages are send to the same node it occurs, when a node receives copies of the same messages from many of its neighbors.

12. When an overlap will occur?

The same event may be sensed by more than one node due to overlapping regions of coverage. This results in their neighbor receiving duplicate reports of the same event.

12. Outline the functions performed by a node in a wireless sensor network.

To enable WSN-based applications, nodes have to provide the following basic functionality:

- Signal conditioning and data acquisition for different sensors
- Storage of data (sample data and configurations)
- Processing capabilities
- Analysis of the processed data for alert generation
- Actuation
- Scheduling and execution of the measurement tasks
- Management of node configuration (e.g. changing the sampling rate and reprogramming of data processing algorithms)
- Reception, transmission and forwarding of data packets
- Scheduling and execution of communication and networking tasks.

SECURITY ISSUES IN AD HOC / SENSOR NETWORK

PART A

1. What is data dissemination in a wireless sensor network?[NOVEMBER/DECEMBER 2016]

Data dissemination is the process of routing queries or data through sensor nodes to intended recipient in sensor network. The sensor nodes gather data from different nodes and forward it to the fixed station or to other nodes for further processing.

2. What wireless sensor networks need localization protocols? [NOVEMBER/DECEMBER 2016]

Localization is the task of determine the position of a sensor or the spatial relationship among objects.

3. Outline the need for data dissemination in a wireless sensor network. [APRIL/MAY 2017]

Data dissemination is the process of routing queries or data through sensor nodes to intended recipient in sensor network. The sensor nodes gather data from different nodes and forward it to the fixed station or to other nodes for further processing.

4. Define Quality of Service. [APRIL/MAY 2017]

QoS is a measure of quality of service that the network provides to the end user or application. QoS parameters in terms of reliability of end-to-end connection, timeliness of packet delivery, robustness, availability of sensor nodes and security are used to measure the QoS performance parameters such as throughput, bandwidth, delay, jitter, delivery ratio and packet loss rate. The fundamental QoS parameters used in Wireless Sensor Network are given below.

QoS Parameters

- Throughput
- Delay
- Jitter
- Packet Lost Rate

5. Define localization and lateration. [NOVEMBER/DECEMBER 2017]

Wireless Sensor Network composed of a large number of in expensive nodes that are densely deployed in a region of interests to measue certain phenomenon .The primary objective is to determine the location of the target.Localization is a process of compute the locations of sensor Device in a network.

6. Define the term data dissemination. [NOVEMBER/DECEMBER 2017]

Data dissemination is the process of routing queries or data through sensor nodes to intended recipient in sensor network. The sensor nodes gather data from different nodes and forward it to the fixed station or to other nodes for further processing.

7. List the benefits of OLSR protocol. [APRIL/MAY 2018]

- Reduced control overhead.
- Low connection setup

8. What is Multi-Lateration(ML) technique? List some of the ML techniques.[APRIL/MAY 2018]

Multi-lateration technique is the technique of location estimation depending on the beacons nodes locations. They are,

- Atomic ML
- Iterative ML

- Collaborative ML

9. Why is energy Efficiency important in WSN Routing? **[NOVEMBER/DECEMBER 2018]**
10. What is synchronized Communication? **[NOVEMBER/DECEMBER 2018]**

1. **What are ways of deployment?**

   The deployment can be either
   - Deterministic
   - Randomized

2. **Compare deterministic and random deployment**
   - In deterministic deployment, the sensors are manually placed and data is routed through pre-determined paths.
   - In random node deployment, the sensor nodes ar4e scattered randomly creating an infrastructure in an ad hoc manner

3. **What are the categories of power saving techniques?**
   - Schedule the wireless nodes to alternates between active and sleep mode
   - Power control by adjusting the transmission range of wireless nodes
   - Energy efficient routing, data gathering
   - Reduce the amount of data transmitted and avoid useless activity.

4. **Define OLSR**

   OLSR is optimized link state routing protocol which is a proactive protocol that employs an efficient link state packet forwarding mechanism called multipoint relaying.

5. **List the advantages of OLSR**
   - Reduced control overhead.
   - Low connection setup

6. **Define localization**

   Localization is the task of determine the position of a sensor or the spatial relationship among objects.

7. **Why GPS is not feasible in localization?**
   - Not available indoor
   - Constraints on the cost of sensor
   - Constraints on the size of sensor
   - Constraints on the energy consumption

8. **What are the two mechanism for location discovery?**
   - Indoor localization
   - Sensor localization

9. **What is the purpose of RSSI?**

   Receiver signal strength indicator was used to determine correlation to distance.

6. **What is ML technique? classify it.**

   Multi-lateration technique is the technique of location estimation depending on the beacons nodes locations. They are,

   Atomic ML
   Iterative ML
   Collaborative ML

7. **Define relative localization.**

   The aim of relative localization was to obtain the relationship of distance or angle between nodes. Its distance is relative not absolute and the same angle.

12. What is coverage?

Coverage is a measure of how well the network can observe or cover an event.

Coverage depends up on:

- Range and sensitivity of sensing nodes
- Location and density of sensing nodes in given region

13. Define breach path

Breach path shows the region of maximum vulnerability in a sensor network where the coverage provided by the sensors is the weakest.

14. What is the use of voronoi diagram?

Voronoi diagram is used to solve the problem of coverage by partitioning the plane into a set of convex polygon such that all points inside a polygon are closest to the sensor enclosed by the polygon

15. How voronoi diagram is drawn?

It is drawn by perpendicular bisector of every line segment joining two sites and using their points of intersection as the vertices of the convex polygons.

16. What is delaunary triangulation?

Delaunary triangulation is a mathematical technique to solve this which is obtained from voronoi diagram by connecting the sites whose polygons share a common edge.

17. What are the three function of PSFQ?

- Message relaying
- Error recovery
- Selective status reporting

18. Define AOA?

The angle between the propagation direction of an incident wave and some reference direction.