Internal Assessment Test 3 – Jan 2024

Sub:	Internet of Things and WSN				Sub Code:	18EC744	Branch:	ECE		
Date:	03/01/2024	Duration:	90 min's	Max Marks:	50	Sem/Sec:	VII/ A, B, C, D		OBE	

Answer any FIVE FULL Questions

		MARKS	CO	RBT
1	Write a short note on operational status of a sensor node with different power consumptions with figures.	10	CO4	L2

Sensors are used by wireless sensor nodes to capture data from their environment. They are hardware devices that produce a measurable response to a change in a physical condition like temperature or pressure. Sensors measure physical data of the parameter to be monitored and have specific characteristics such as accuracy, sensitivity etc.

		MARKS	CO	RBT
2	What is an embedded operating system suitable for WSN and explain different programming paradigms.	10	CO4	L2

		MARKS	CO	RBT
3	With neat figures explain Optimization goals and figure of merit for wireless sensor networks.	10	CO4	L2

> **Optimization goals and figures of merit:**   ....cntd
> ❖ *Scalability:*
> ✓ The ability to maintain performance characteristics irrespective of the size of the network is referred to as scalability.
> ✓ With WSN potentially consisting of thousands of nodes, scalability is an obviously essential requirement
> ✓ The need for extreme scalability has direct consequences for the protocol design
> ✓ Often, a penalty in performance or complexity has to be paid for small networks
> ✓ Architectures and protocols should implement appropriate scalability support rather than trying to be as scalable as possible
> ✓ Applications with a few dozen nodes might admit more-efficient solutions than applications with thousands of nodes

4	Explain Mediation Device protocol with advantages and disadvantages	10	CO4	L2

- Goal: Avoid useless listening on the channel for messages
- Uses: mediation device (MD) which is available all the time
- Protocol
  - Sender B sends RTS to MD
  - MD stores this information
  - Receiver C sends query to MD
  - MD tells reciever C when to wake up
  - C sends CTS to B (now in sync)
  - B sends data
  - C acknowledges
  - C returns to old timing
- Main disadvantage:
  - MD has to be energy independent
  - Solution: Distributed Mediation Device Protocol
    - Nodes randomly wake up and serve as mediation device
- Problem: no guarantees on full coverage of MD
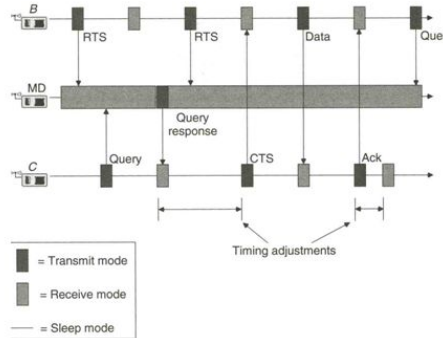
5	Explain CSMA protocol with proper flow diagram.	10	CO5	L3

Initialize
NB=0, CW=2, BE=$macMinBE$

Random backoff
Period chosen from
$[(0, 2^{BE}) - 1]$ slots

Perform CCA

Channel idle?

N:
CW=2
NB=NB+1
BE=min(BE+1, $macMaxBE$)

NB> $macMAXCSMABackoffs$?

Failure

Y:
CW=CW−1

CW=0?

Success
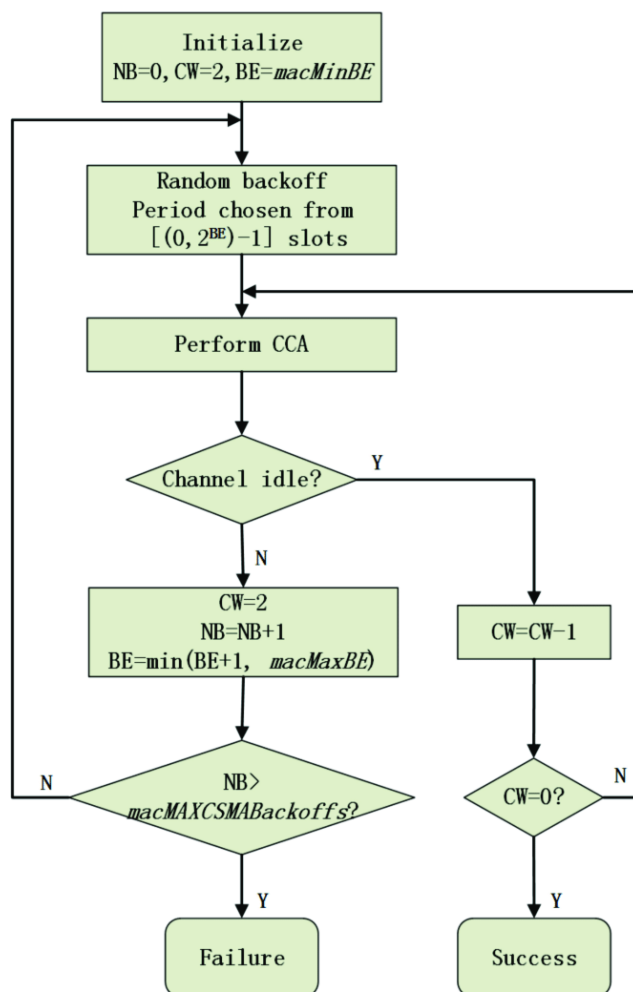
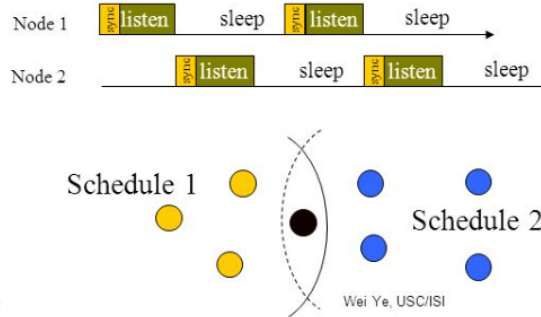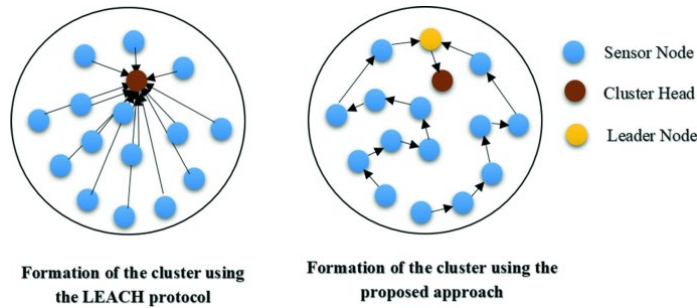| 6	Explain S-MAC protocol and explain how It handles the major sources of energy inefficiency in WSN.	10	CO5	L3

	## S-MAC
	
	Ye, Heidemann, and Estrin, INFOCOM 2002
	
	- Traditional monolithic protocol design
	- Synchronized protocol with periodic listen periods
	- "Black Box" design
	  - Designed for a general set of workloads
	  - User sets radio duty cycle
	  - SMAC takes care of the rest so you don't have to
	  - Integrates higher layer functionality into link protocol
	- T-MAC
	  [van Dam and Langendoen, Sensys 2003]
	  - Reduces power consumption by returning to sleep if no traffic is detected at the beginning of a listen period			

7	Explain leach protocol with near diagram. Formation of the cluster using the LEACH protocol Formation of the cluster using the proposed approach Sensor Node / Cluster Head / Leader Node LEACH is a hierarchical protocol in which most nodes transmit to cluster heads, and the cluster heads aggregate and compress the data and forward it to the base station (sink). Each node uses a stochastic algorithm at each round to determine whether it will become a cluster head in this round. LEACH assumes that each node has a radio powerful enough to directly reach the base station or the nearest cluster head, but that using this radio at full power all the time would waste energy.	10	CO5	L3