WIRELESS SENSOR NETWORKS
(ECEN 4246)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) In flooding mechanism, each sensor receives a data packet and then _____ it to all neighboring nodes.
(a) broadcasts (b) hide (c) stops (d) erases

(ii) Which electronic circuit interfaces with which one of the component's of WSN
(a) Sensors (b) Energy sources
(c) Sensor and energy source (d) none of (a), (b) & (c).

(iii) A sensor network in WSN can be of _____ topology.
(a) star (b) multi-hop wireless mesh
(c) advanced multi-hop wireless mesh (d) all of (a), (b) & (c)

(iv) Which requirement is not a part of the WSN standard?
(a) Reliability (b) Memory
(c) Latency (d) Wireless Transmission range.

(v) A process that selects paths for traffic in a network is called
(a) Routing (b) Flooding (c) Connecting (d) both a and b.

(vi) LEACH is self-organizing, adaptive _____ protocol in which sensor nodes will organize themselves into _____ clusters and cluster members elect cluster head
(a) unit, cost (b) non recurring, engineering
(c) unit, big (d) clustering, local

(vii) For reliable data transport, even when an event has been reliably detected, this information must be transported over _____ hops towards special sink or _____ and further to the user.
(a) zero, one path (b) multiple, gateway nodes
(c) one, two path (d) zero, two path

(viii) Information about Angle of Area measurement is obtained from receiver Antennas _____ and _____ response.
(a) amplitude, phase (b) gain, weight
(c) height, gain (d) power, modulus

(ix) An OS for WSN should provide implementations of communication protocols that support _____ multimedia streams.
(a) real-time (b) short-time
(c) discontinued (d) network

(x) For reliable data transport, even when an event has been reliably detected, this information must be transported over _____ hops towards special sink or _____ and further to the user.
(a) zero, one path (b) multiple, gateway nodes
(c) one, two path (d) zero, two path

Group - B

2. (a) What is a WSN? Describe its ISO-OSI architecture with different layers? What are its uses? [(CO1)(Remember/LOCQ)]
(b) What are the difference between a WSN network and an Adhoc network? [(CO2)(Understand/LOCQ)]
(1 + 5 + 2) + 4 = 12

3. (a) With a neat diagram, Explain the sensor network architecture. [(CO2)(Remember/LOCQ)]
(b) Analyse the Key design challenges in WSN in comparison with Ad Hoc wireless networks. [(CO3)(Analyze/IOCQ)]
6 + 6 = 12

Group - C

4. (a) Name a few standards that are currently used to ratify the WSN networks to maintain quality. Discuss how these quality standards are applied across the ISO-OSI WSN layers. [(CO4)(Remember/LOCQ)]
(b) What is data flooding, data gossiping and rumor routing? Explain with examples? [(CO4)(Analyze/LOCQ)]
(2 + 4) + (2 + 2 + 2) = 12

5. (a) In WSN under network layered protocol what is the use of the "low - energy adaptive clustering hierarchy (LEACH)" protocol. [(CO3)(Understand/HOCQ)]
(b) What is the importance of SINR? In which ISO-OSI layer of WSN is it considered? [(CO4)(Understand/LOCQ)]
(c) Describe the active state and sleep state scheduling of sensors for WSN protocols. [(CO4)(Analyze/IOCQ)]
4 + 4 + 4 = 12

Group - D

6. (a) What is the need for time synchronization in WSN? Highlight the issues happened in a active running network when the time synchronization failed. [(CO5)(Remember/LOCQ)][(CO5)(Create/HOCQ)]
   (b) Illustrate with example three methods of synchronization used for WSN? [(CO5)(Understand/LOCQ)]
   (3 + 3) + 6 = 12

7. (a) What is time synchronization in WSN? [(CO4)(Remember/LOCQ)]
   (b) Illustrate with example three methods of synchronization used for WSN? [(CO5)(Understand/IOCQ)]
   3 + 9 = 12

Group - E

8. (a) Why data transport reliability an issue with WSN? How is it taken care? [(CO4)(Remember/LOCQ)]
   (b) What is congestion control in WSN? Why it is needed? [(CO3)(Understand/LOCQ)]
   (c) Discuss the importance of energy saving in WSN protocols. Name one energy saving WSN protocol. [(CO6)(Analyse/IOCQ)]
   4 + 4 + 4 = 12

9. (a) Illustrate the concept of data centric networking in association with WSN with examples. [(CO1)(Remember/LOCQ)]
   (b) Justify the use of real time OS with WSN systems. [(CO2)(Understand/IOCQ)]
   (c) List the security issues in WSN associated with routing. [(CO2)(Analyse/IOCQ)]
   4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	57.29	32.29	10.42

Course Outcome (CO):

After the completion of the course students will be able to
1. Understand the differences between Ad Hoc wireless networks and Sensor networks.
2. Analyze the properties of WSN.
3. Compare performances of sensors and protocols.
4. Find causes of problem in WSN and to solve them.

5. Develop new applications of WSN.
6. Form ideas about new sensors and efficient protocols for new applications.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.