

MASTER OF COMPUTER SCIENCE AND ENGINEERING EXAMINATION, 2025

(1st Semester)

WIRELESS SENSOR NETWORKS

Time: Three Hours

Full Marks 100

Answer Question No. 1 and any four from the rest.

1. Answer any six of the following questions: 20
- (i) What are the different interaction patterns between sources and sinks in a wireless sensor network?
 - (ii) Provide a brief overview of a sensor node architecture.
 - (iii) A “good sensor” must obey certain rules – mention the rules.
 - (iv) What are the different types of functionalities of nodes in an 802.15.4 network?
 - (v) What do you mean by “minimum energy routing protocol”? Why is it important?
 - (vi) WSN is a “data-centric network”, not an “address-centric network” – what do you understand from this statement?
 - (vii) What is the purpose of data aggregation?
 - (viii) Explain the terms ‘clock skew’ and ‘drift rate’.
2. (a) Mobile Ad-hoc Network (MANET) and Wireless Sensor Network, both support ad-hoc communication and mobility of the participants. So what are the differences between them?
- (b) Discuss a sink initiated routing protocol in WSN.
- (c) What are the different types of messages in SPIN protocol?
- (d) What are the different variations of SPIN protocol?
- 4+8+4+4=20
3. (a) “When to switch on a receiver is not clear” – Why do we need to switch off and switch on a receiver on a sensor device?
- (b) What do you mean by “overhearing” and “idle listening” for a sensor device?
- (c) Explain how sleep schedules of the nodes are maintained in S-MAC protocols for WSN.
- (d) What is the use of “Network Allocation Vector”
- 4+4+8+4=20
4. (a) What are the two phases of LEACH protocol? Discuss only the **first** phase in detail.
- (b) Discuss the interference problem in multiple cluster LEACH protocol. How can the problem be overcome?
- (c) What is the problem of ‘tree-based aggregation? How is it overcome using ‘Synopsis Diffusion’?
- (d) How are the above two approaches combined in ‘Tributaries and Deltas’?
- 6+4+7+3=20
5. (a) Why is localization important? What are the problems of using GPS?
- (b) What are the different techniques for estimating the distance between two nodes?

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(c) Discuss collaborative multilateration and iterative multilateration techniques for localization.

(d) With an example explain how the DV-hop propagation technique can be used to estimate the locations of the nodes.

4+7+4+5=20

6. (a) Describe the problems that may arise without time synchronization in a WSN.

(b) How are any two nodes in a WSN time-synchronized using messages?

(c) What is 'Receiver-Receiver Synchronization'?

(d) Discuss "Time-sync Protocol for Sensor Network" in the context of time-synchronization of sensor network.

(e) Explain the key idea of "Reference-Broadcast Synchronization".

3+3+3+6+3=20

7. (a) What do you mean by "Perimeter-mode Forwarding" in GPSR algorithm in Geographic Routing? Give an example.

(b) Write the algorithm for "Greedy Path Vector Face Routing". Give an example.

(c) What are the different types of security attacks at the network layer of a WSN?

6+8+6=20