2023

COMPUTER SCIENCE AND ENGINEERING

Paper : CSEL-843-Elective-IV

(Wireless Sensor Network)

Full Marks : 70

The figures in the margin indicate full marks.

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

Answer ***question nos.*** **1, 2** and ***any four*** questions from the rest.

1. Answer ***any five*** questions : 2×5

(a) Which data forwarding approach is better suited for WSN based environment monitoring — push based or pull based? Justify.

(b) How does MACAW extend MACA and what is the purpose of the additional control messages?

(c) The key idea behind CSMA/CD is that the sender detects collisions, allowing it to react correspondingly. Why is this approach not practical in wireless networks?

(d) State the motivation behind proposing MARCH protocol at MAC layer.

(e) Can you think of an application scenario where contention based MAC performs better than contention free MAC protocol?

(f) In general, the large sensor networks are clustered. — State the reasons.

(g) Why DSDV uses 'immediate advertisement' instead of periodic advertisement for any change in network?

2. Answer ***any five*** questions : 4×5

(a) How are the idle-listening and overhearing reduced in S-MAC protocol?

(b) Compare the performance between receiver-initiated and sender-initiated Preamble based MAC with necessary reasons.

(c) How the 'exposed station problem' affects the performance of a MAC protocol? Can you suggest a solution?

(d) Define the importance of the terms 'Coverage' and 'Connectivity' in context of Density Control in WSN.

(e) In AODV, is it possible that route discovery packets travel in the network forever? Justify.

(f) Consider the following WSN scenarios and explain why you would choose either a proactive or a reactive routing for the given use cases :

(i) A WSN is used to detect the presence of vehicles, where each sensor locally records the time of vehicle detection. These records are delivered to the base station only when the sensor is explicitly queried.

(ii) A WSN is used to monitor air pollution in a city where every sensor reports its sensor data once every minute to a single remote base station. Most sensors are mounted on lamp posts, but some are also mounted on city buses.

(g) How is the location information used to enhance the routing performance in adhoc networks? Discuss with an example.

3. (a) In what sense, TRAMA is better performer than TDMA in WSN?

(b) Describe the methods for slot allocation among contender nodes in TRAMA and Zebra MAC Protocol.

(c) Mention the performance of Zebra-MAC in low load. 2+6+2

4. (a) State the advantage(s) of SPIN and Directed Diffusion.

(b) Describe a method with suitable illustration that uses the strength of the above said protocols.

(c) Comment on the metric (parameter) based performance for establishing the contribution of the protocol. 3+5+2

5. (a) Define 'Lifetime of a WSN'. Why is it so important?

(b) Describe the strategies, in detail, for increasing the lifetime in TEEN routing protocol.

(c) Discuss the contribution of APTEEN over the TEEN in terms of adaptability. 2+5+3

6. (a) Illustrate with an example the inherent problem of 'looping' in context of Distance Vector Routing. Discuss the role of Destination Sequence Number in DSDV in this context.

(b) State the process of cache updation in DSR.

(c) State the contribution of DBTMA over MACA-W in terms of performance metrics. (3+3)+2+2

7. (a) Explain the difference between external and internal time synchronization through an example.

(b) Consider two nodes, where the current time at node A is 1100 and the current time at node B is 1000. Node A's clock progresses by 1.01 time units once every 1 s and node B's clock progresses by 0.99 time units once every 1 s. Explain the terms clock offset, clock rate, and clock skew using this concrete example. Are these clocks fast or slow, and why?

(c) Describe a sender-receiver synchronization approach within WSN. 3+3+4