

Roll No: -----

**UNIVERSITY OF PETROLEUM AND ENERGY
STUDIES**



End Semester Examination – April, 2018

Program/course: B.Tech. ICE

Subject: Wireless Sensor Networks

Code : ELEG427

No. of page/s: 3

Semester – VIII

Max. Marks : 100

Duration : 3 Hrs

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- Note: 1) Mention Roll No at the appropriate place in the question paper.
2) Answers should be brief and concise.
3) All questions are compulsory.

Section A (4Q×5M=20 Marks)

1. How to estimate range to a node to which no direct radio communications exists? Name and explain any one of such method.
2. Define components of a typical sensing node of a WSN with its block diagram.
3. Explain the use of SRAM, SD Card, SPI Flash and EEPROM in Microcontrollers?
4. Discuss all possible advantages and disadvantages of centralized topology of Wireless Networks.

Section B (4Q×10M=40 marks)

5. Elucidate in brief, three ways handshake used for communication using TCP (Connection, Establishment and Termination).
6. Suppose a WSN is to be designed for the Patient Monitoring System of a Hospital for about 100 patients under critical observations. Identify the technical issues and challenges for such an application.
7. Elucidate in brief, Automatic Repeat Request (ARQ) error control mechanism implemented by Transmission Control Protocol (TCP). Discuss all common ARQ retransmission schemes used by TCP (with neat diagrams).

8. A Block diagram of MICA2 sensor node hardware is shown in the figure 1.

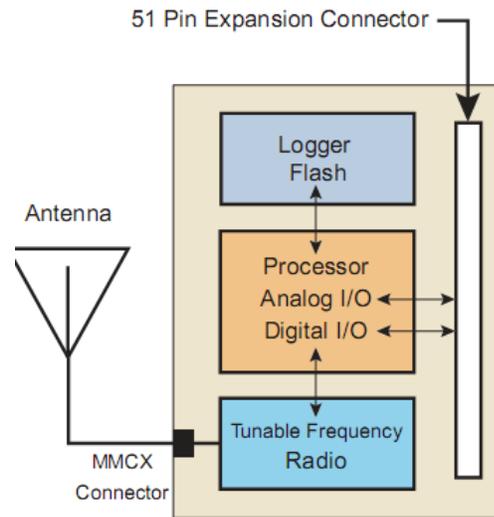


Figure 1: MICA2 Sensor Node Hardware

- Identify the range of transmission band that can be used by MICA2 mote.
- What is the size of flash memory for data logging used by MICA2 mote.
- Identify the transceiver IC and its specifications used by MICA2 mote.
- Name the WSN OS compatible with the MICA2 mote.

Contd...

Section C (2Q×20M=40 marks)

9. Design a WSN (block diagram) that can be used in Building Automation (Smart Buildings)? Analyze its features and specifications, including possible wireless standards and network topologies for this application.
10. Assume that nodes A, B and C are within range of each other. Node D is within range of Node C and Node A transmits to Node B. Refer the figure 2 for the MAC protocol that has been designed to facilitate smooth communication in the WSN environment.

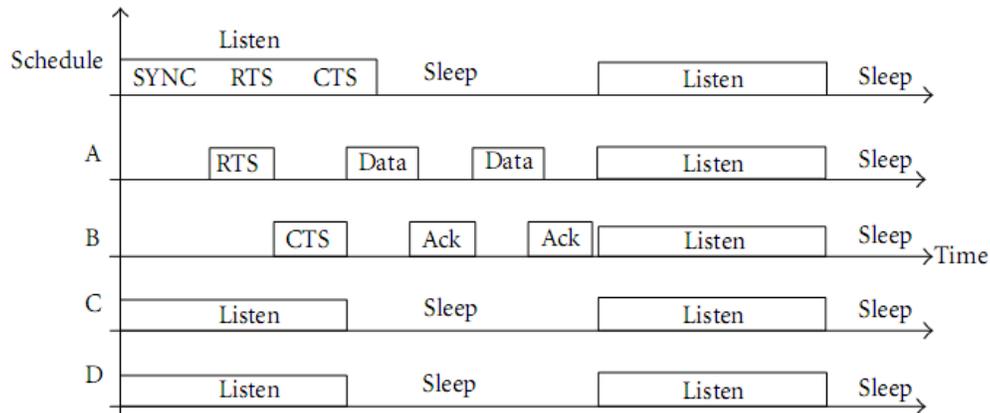


Figure 2: MAC Protocol for WSN

- Identify and define the working of the MAC protocol shown in figure 2.
- Identify the applications in which the above shown MAC protocol can be used.
- What is the level of synchronization required between nodes for the shown MAC protocol.

*** End of Ques. Paper ***

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Section A (4Q×5M=20 Marks)

1. Define components of a typical sensing node of a WSN with its block diagram.
2. Explain the layered architecture of OSI Reference Model for Wireless Sensor Network, with the functioning of each layer.
3. How to estimate range to a node to which no direct radio communications exists? Name and explain any one of such method.
4. What are the connectivity issues and deployment challenges in implementing WSN in Building Automation (Smart Buildings)?

Section B (4Q×10M=40 marks)

5. Suppose a WSN is to be designed for the early Forest fire during summer. Consider the size of forest to be of 100 square Kms. Identify and define the design objectives and technical challenges for such an application.
6. Elucidate in brief, three ways handshake used for communication using TCP (Connection, Establishment and Termination).
7. Elucidate in brief, Automatic Repeat Request (ARQ) error control mechanism implemented by Transmission Control Protocol (TCP). Discuss all common ARQ retransmission schemes used by TCP (with neat diagrams).

8. A Block diagram of IMote2 sensor node hardware is shown in the figure 1.

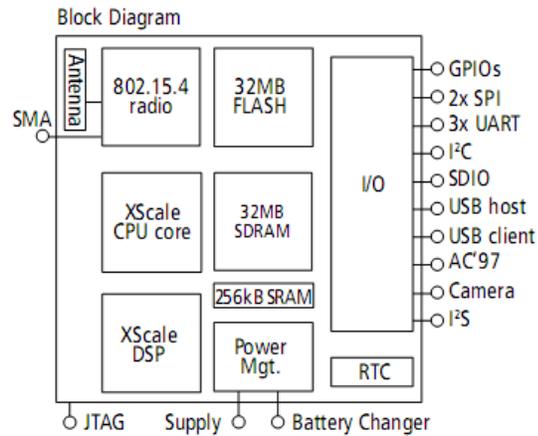


Figure 1: IMote2 Sensor Node Hardware

- a. Identify the range of transmission band that can be used by *IMote2* mote.
- b. What is the size of flash memory for data logging used by *IMote2* mote.
- c. Identify the transceiver IC and its specifications used by *IMote2* mote.
- d. Name the WSN OS compatible with the *IMote2* mote.

Contd...

Section C (2Q×20M=40 marks)

9. Design a WSN (block diagram) that can be used in Structural Health Monitoring (for Bridges, etc.). Analyze its features and specifications, including possible wireless standards and network topologies for this application.
10. Refer the routing protocol shown in the figure 2. Routing protocols are designed to achieve special purposes in WSN.

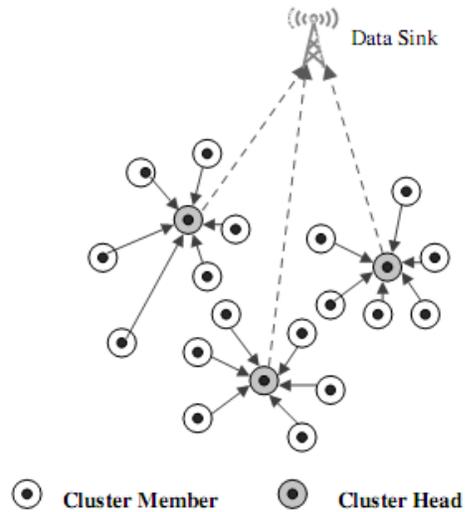


Figure 2: Routing Protocol for WSN

- Identify and define the working of the Routing protocol shown in the figure.
- Identify the applications in which the shown Routing protocol can be used.
- What are the routing issues that the shown routing protocol is capable to resolve?

*** End of Ques. Paper ***