

Roll No: -----

**UNIVERSITY OF PETROLEUM  
AND ENERGY STUDIES**



**End Semester Examination – April, 2017**

**Program/course: B Tech (ICE)**

**Semester – VIII**

**Subject: Wireless Sensor Networks**

**Max. Marks : 100**

**Code : ELEG 427**

**Duration : 3 Hrs**

**No. of page/s: 2**

**Instructions:**

- Attempt all questions
- Assume any data if required and indicate the same clearly. Unless otherwise indicated symbols and notations have their usual meanings.
- Strike off all unused blank pages

**Section-A (5x4 = 20 Marks)**

1. What are the required mechanism for wireless sensor network (WSN)?
2. What is the difference between passive sensors and active sensors and can you name a few examples for each category
3. Differentiate between 802.11(WLAN), 802.15.1(Bluetooth) and 802.15.4 (ZigBee).
4. Discuss two sensing models used in sensor networks.
5. Briefly describe the sources of energy waste in the design of MAC protocol.

**Section-B (4x10 = 40 Marks)**

6. Explain the following MAC protocol: Demand assignment with polling based scheme and pure ALOHA.
7. (a) Explain in detail about the Directed diffusion routing algorithms. [7]  
(b) Give three reasons for supporting dynamic reprogramming in WSNs [3]
8. Explain the following topology control algorithms: power control and growing tree dominating set algorithm.
9. (a) List out the functional aspects of operating system for WSN. Explain any two of them.  
(b) Explain the following concepts in TinyOS: (i) commands (ii) tasks (iii) events

**Or**

Write short notes on: (a) Data dissemination and (b) Mica mote

**Section-C (2x20 = 40 Marks)**

10. Fig.1 shows a network topology with three anchor nodes. The distances between anchors  $A_1$  and  $A_2$ , anchors  $A_1$  and  $A_3$ , and anchors  $A_2$  and  $A_3$  are 50m, 80m, and 110 m, respectively. Use the Ad Hoc Positioning System to estimate the location of the gray sensor node S (show each step of your process).

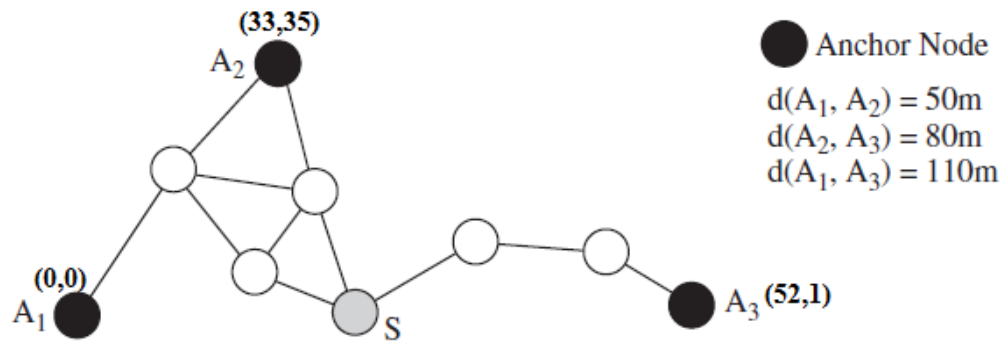


Fig.1

11. Consider the topology in Fig.2 Node A wishes to forward a packet toward destination L via one of its neighbors (its communication range is indicated with the circle). Which neighbor will A choose? Justify your answer with proper explanation. For each of the following forwarding strategies: (i) greedy forwarding; (ii) nearest with forwarding progress; (iii) most forwarding progress within radius; (iv) compass routing. Give answer

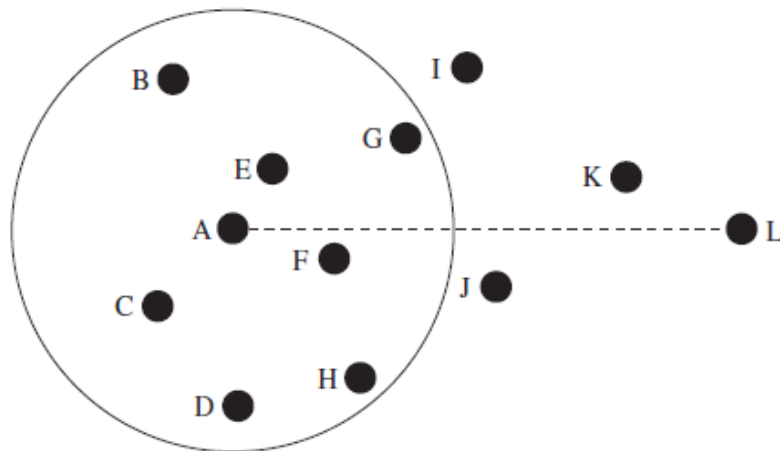


Fig.2

\*\*\*\*\*End of the question paper\*\*\*\*\*

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**Section-A (5x4 = 20 Marks)**

1. Mention the major applications of Wireless Sensor Networks (WSN).
2. Differentiate between Contention - Based Protocols and Scheduled based protocols
3. Why is the IEEE 802.15.4 standard preferable over the IEEE 802.11 standard for most wireless sensor networks?
4. What are the deployment challenges in Wireless Sensor Networks?
5. Briefly describe the sources of energy waste in the design of MAC protocol.

**Section-B (5x8 = 40 Marks)**

6. Explain in brief about energy Consumption of Sensor nodes.
7. Explain in brief about Classifications of MAC Protocol in wireless sensor networks
8. Explain the following topology control algorithms: power control and growing tree dominating set algorithm.
9. Three nodes A, B, and C are known to be positioned at locations (0, 0), (10, 0), and (4, 15), respectively. Node D is estimated to be a distance of 7 from A, a distance of 7 from B, and a distance of 10.15 from C. Determine the location of D using trilateration.
10. Explain in detail about Tiny OS.

**Or**

Write short note on: **(a)** ZigBee network in WSN and **(b)** Data dissemination in WSN

**Section-C (2x20 = 40 Marks)**

11. Determine the unknown position of the nodes A, B and C using iterative multilateration method. The range between anchor nodes and unknown nodes are given in fig. 1  $r(A1,A) = 1m$ ;  $r(A2,A) = 4m$ ;  $r(A3,A) = 5m$ ;  $r(A3, B) = 6 m$ ;  $r(A,B) = 6 m$ ;  $r(A,C) = 6 m$ ;  $r(A2,C) = 4m$ ;  $r(B,C) = 5 m$ ;  $r(A4,B) = 4 m$

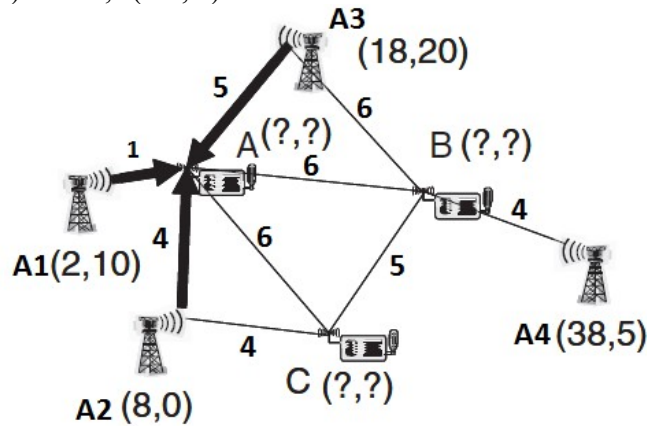


Fig.1

12. For the network topology shown in Fig.2, identify the optimal routes for source A to sink M according to the following criteria (describe how you compute the cost for the optimal route). The numbers X/Y along each link indicate the latency (X) and energy cost (Y) for transmitting a single packet over the link. The number Z under each node indicates the node's remaining energy capacity. (a) Minimum number of hops (b) Minimum energy consumed per packet (c) Maximum average energy capacity (eliminate hops that would result in a higher average but unnecessarily add to the route length!) (d) Maximum minimum energy capacity (e) shortest latency

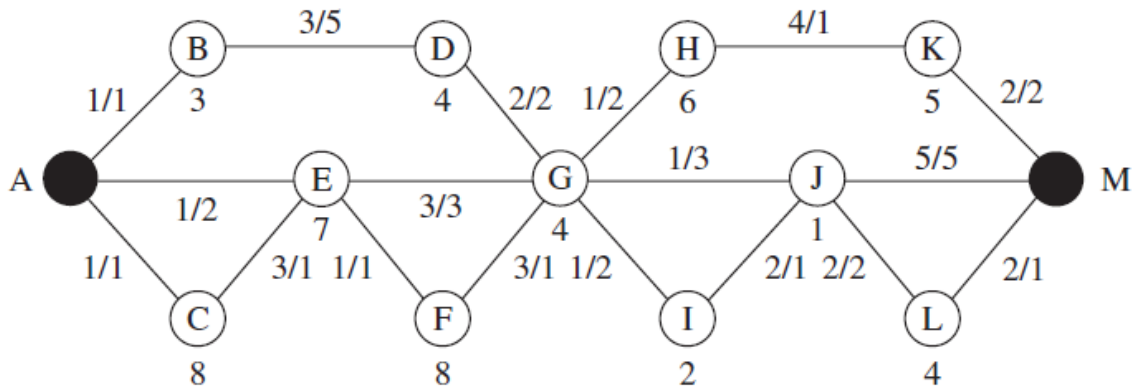


Fig.2

\*\*\*\*\*End of the question paper\*\*\*\*\*

