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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Eighth Semester, B.E. – Computer Science and Engineering

Semester End Examination; June -2016

Wireless Sensor Networks

Time: 3 hrs

Max. Marks: 100

Note: Answer any **FIVE** full questions selecting at least **TWO** full questions from each part.

PART - A

- 1 a. Discuss in brief some of the mechanisms that form typical parts of WSNs. 8
- b. Identify the technologies that have enabled WSNs. Also outline the features and advantages of those technologies. 6
- c. Explain certain common traits required in a WSN irrespective of its application. 6
- 2 a. Draw the block diagram of a sensor node and explain the most important tasks and characteristics of transceiver device used in a sensor node. 10
- b. What are the desirable features of an embedded operating system? Illustrate and explain event – based programming with a suitable diagram. Compare it with sequential and process – based programming. 10
- 3 a. Distinguish between single – hop and multi-hop network considering suitable scenarios. 6
- b. Justify how high – level QOS attributes can optimize the performance of a WSN. 6
- c. What is the need of a gate way? Illustrate and explain two WSNs connected with a tunnel over the internet. 8
- 4 a. List the most crucial factors influencing physical layer design in WSNs and explain any two of them in detail. 10
- b. Describe the working principle of S – MAC protocol. Also point out its advantages and drawbacks. 10

PART - B

- 5 a. Explain the mediation device protocol for transmit, receive and sleep modes, of a node with neat diagram. 8
- b. Discuss the concept of wakeup radio with a suitable example and bring out some of its drawbacks. 6
- c. Explain energy – efficient routing in terms of:
- i) Minimization of energy per packet 6
- ii) Maximization of network lifetime.
- iii) Routing considering available battery energy.

- 6 a. Indicate the importance of clustering and explain the concept of clustering with a suitable example. 6
- b. What is time synchronization? Assume there are two nodes i and j . The clocks at i and j are not synchronized clock at i lags with respect to clock at j by a factor d . Delay D in the channel between two nodes is constant and symmetric suppose node ' i ' reads $10\mu\text{s}$ and sends a packet to node j , and node j records $50\mu\text{s}$ when packet was received. Node j again sends a packet back to node i at $60\mu\text{s}$ and node i receives the packet at $80\mu\text{s}$. Calculate the delay D and the clock phase difference d . 6
- c. List the properties of localization and positioning procedure. Consider seven anchor nodes at positions $(2, 1)$, $(5,4)$ $(8, 2)$, $(3,1)$, $(7, 5)$, $(2, 8)$ and $(4, 6)$. The distance estimates from these nodes to node A at unknown position are $5, 1, 4, 2, 3, 7$ and 4 respectively. Compute the location of node A . 8
- 7 a. Identify different categories of sensor node hardware and explain each of them with examples. 6
- b. Discuss different challenges faced in using traditional programming technologies for a WSN. Also explain the terms design methodology and design platform. 6
- c. With a neat block diagram, explain Berkeley MICA mote architecture. 8
- 8 a. Provide the interface definition of Timer component in nes C. 6
- b. Explain ns – 2 simulator and its sensor network extensions with suitable examples. 6
- c. What is a collaboration group? List different examples of group and explain any one in detail. 8

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