AS-74.3199 Wireless Automation

Exam 18th of May 2012

Answer all the questions. The answer with the least points may be substituted by the points you have from the optional homework (max. 6 points). You can get a maximum of 6 points from each question in the exam (total 36 points).

You can answer in Finnish, Swedish or English.

1. Explain the following concepts (1 p / concept)
    a. Carrier Sense Multiple Access (CSMA)
    b. Jitter margin
    c. Sensor network
    d. Medium Access Control (MAC) protocol
    e. FreeRTOS
    f. Integral Square Error (ISE)
2. Security in wireless automation
    a. There exist three levels of security. What are they? Describe what they mean. (3 p)
    b. Temperature measurements are transmitted wirelessly in a factory. What security techniques are needed? What security do the factory operators want? (3 p)
3. The industry is conservative and will not adopt wireless control before some fundamental problems are solved. Name three of these "show stoppers", explain what the problems are, and why it is important to solve these before widespread deployment in the industry. (6 p)

Turn the page!

4. Transmitting a packet might fail.

    a. What can cause a failure in reception? (3 p)

    b. What diversity techniques can be applied to ensure that the re-transmission is successful? (3 p)

5. Practical constraints of wireless control systems

    a. From the control system point of view, how are the transmission failures seen? (2 p)

    b. How does the failure influence the control? How is it seen in the control result? (1 p)

    c. How can the controller be designed such that these failures does not cause harm to the control system? Mention several different techniques. (3 p)

6. You are a technical sales representative from the company "Wireless Sensor Systems". You visit a paper mill with the intent to sell your wireless sensor products. Present the advantages of *wireless* sensors in automation for the paper mill executives? What components does a wireless automation system compose of? What devices from your (hypothetical) product line would you recommend for the paper mill? (6 p)