

# AS-0.3400 Wired and wireless automation

**Exam 11.4.2014**

## **Instructions:**

- write your answers in separate sheets of paper; question 1 in paper 1 etc.
- write your name, student number etc. in all three papers and number the papers 1-3
- all three questions are equal in points so the expected length of essays is also equal
- expected length of answer per question: about two pages (max 4 pages)
- the questions contain a-b-c... to help you in your answer, however, you don't have to strictly follow this structure in your answer
- language of your essays: English or Finnish/Swedish

## **1. Why standards are needed in Wired & Wireless automation? (10p)**

- a) What is typical focus of standards on physical layer? Limit your answer to what are agreed on physical layer. Remember to discuss both wired and wireless standards.
- b) Discuss about what is needed to standardize (must)? What is nice to standardize?
- c) Who makes standards? How are standards agreed? What is de facto standard?
- d) Discuss two sides of standardization, pros and cons.

## **2. Compare LIN bus, CAN bus and FlexRay bus (10p)**

- a) Discuss what are the common features and the main differences? Remember in comparison different layers and different points of view.
- b) Is there some feature that LIN bus has that the other two do not? How about FlexRay?

## **3. Wireless communications (10p)**

- a) Explain the reasons for signal modulation and describe some signal modulation technique. What is the tradeoff when selecting the number of bits per symbol?
- b) Classify communication transceivers ("radio technologies"), discussed during this course, available for short, medium and long distance wireless communications in automation? Evaluate their properties from the wireless automation system point of view, that is, which technologies are suitable and why? In which parts of the wireless automation system each technology could be used and why?