

# UNIVERSITY OF OSLO

## Faculty of Mathematics and Natural Sciences

**Exam in** : FYS 3240/4240  
**Day of exam:** : 16. June 2017  
**Exam hours:** : 14.30 – 17.30  
**This examination paper consists of 2 pages.**

**Permitted materials:** : **Calculator**

*Make sure that your copy of this examination paper is complete before answering.*

### Problem 1

- a) What is PCI Express?
- b) What is PXI?
- c) Why is RAID used in data acquisition?
- d) What are common ADC errors?
- e) Explain how ground loops can be avoided in DAQ-systems.
- f) Can you list three types of computer memory in addition to DRAM?
- g) What is “File buffering” in an operating system, and when can it be an advantage to bypass this?
- h) Why is GPT used for hard drive partitioning?
- i) Explain some differences between an embedded and a PC-based data acquisition system.
- j) List 5 different time synchronization technologies/techniques and for each of them specify a time precision and proximity (range) interval for the given technology.

### Problem 2

- a) Explain the LabVIEW code in Figure 1.
- b) Why is the “Producer-consumer” architecture used when making DAQ-software?
- c) Explain the difference between batch processing and recursive processing of measurement data.
- d) What is a Kalman filter? Explain.

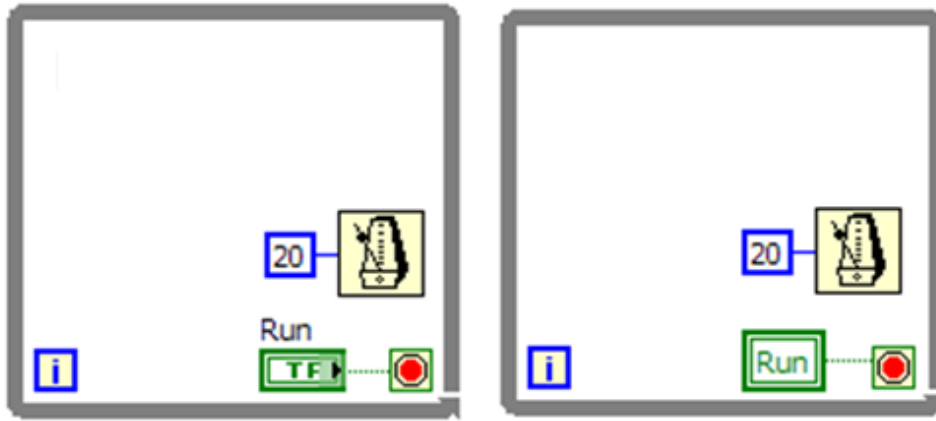


Figure 1.

### Problem 3

- Explain what the CPU does when receiving an interrupt signal.
- The AVR microcontroller has registers that are locked. Why is this needed and how is the register locked? In the lab we unlocked CLK.CTRL, why?
- What is a pull-up configuration? Why did we use it for the CapSense touch buttons in the lab?