UNIVERSITY OF OSLO

Faculty of Mathematics and Natural Sciences

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

Problem 1

a) Explain how memories are used when data are transferred from a DAQ-card and into the DAQ software program. The DAQ-card is assumed to be configured for continuous sampling.

b) Explain overwrite and overflow errors when reading from a DAQ-card.

c) How can the errors in problem 1b) be avoided?

d) Given that a 100 Hz sinus signal is sampled by a DAQ-card with a sample frequency of 50 kHz, and the buffer size of the DAQ-card is 1000 samples. If you plot the 1000 samples in a graph, how many periods of the 100 Hz signal do you see?

e) Explain the term oversampling, and why it is useful in data acquisition.

Problem 2

a) Explain the differences between software timing and hardware timing, and give examples of how both timing techniques can be used in a software program for data acquisition.

b) Given a clock with an error of 20 ppm (0.002 %), what is the accumulated clock error during one day (24 hours)?

c) What is the typical accuracy of the following time synchronization technologies: GPS, IEEE-1588, IRIG-B, NTP and TCP/IP?

d) What is a leap second, and why is it used?

Problem 3

a) Explain RAID-0 and RAID-5.
b) Why is it a limit of about 2.2 TB in disk size for Windows XP 32 bit?
c) Explain the new standard in use to avoid the limitation in problem 3b).
d) Explain the term "Hardware acceleration", and give two examples of how it can be used.
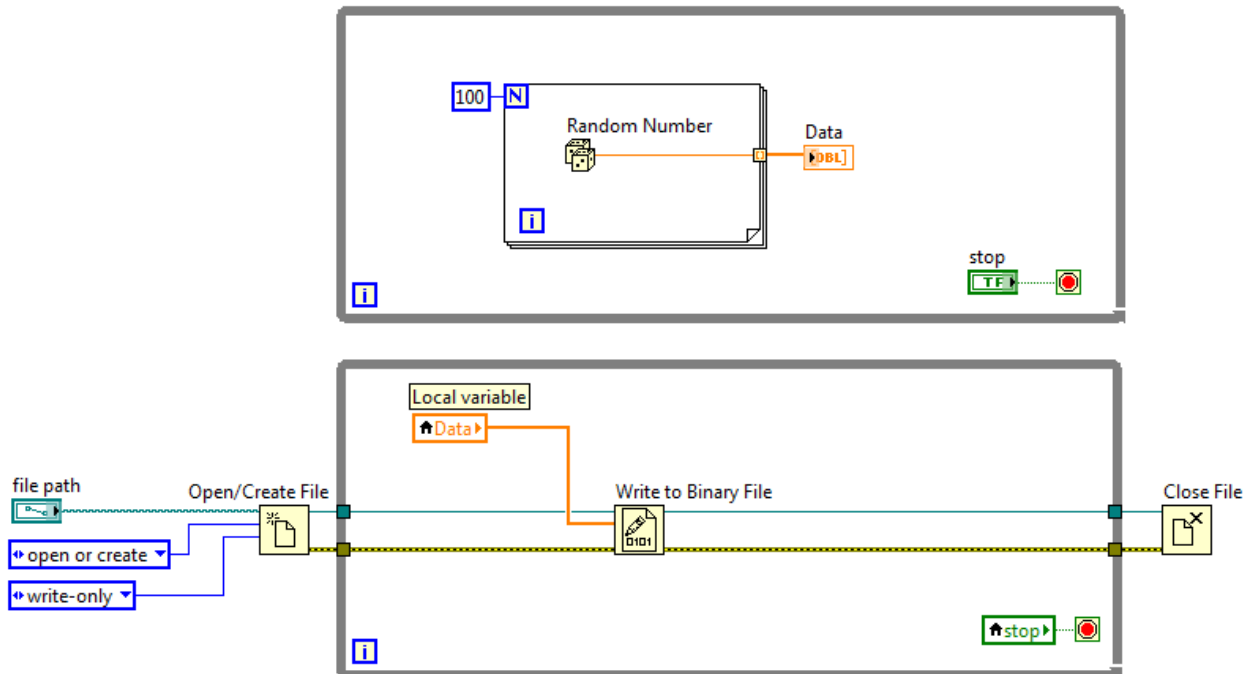e) What is the problem(s) with the LabVIEW code in *Figure 1* ?

Figure 1: LabVIEW code for problem 3 e)