**Workshop 04**

**Core Body of Knowledge (CBOK)  Areas:** abstraction, design, hardware and software, data and information, and programming (see [here](http://www.acs.org.au/__data/assets/pdf_file/0007/7792/The-ICT-Profession-Body-of-Knowledge.pdf) for a detailed description of the CBOK).

Read the Questions below and prepare your answers for your session. Show your development of your answers in the logbook for this assignment in the [web-submission system](ttps://cs.adelaide.edu.au/services/websubmission).

**Question 1:**

Look at the diagram of the machine on slide 8 of lecture 7 of this course. Consider the A-instruction format:

0vvv vvvv vvvv vvvv

Answer the following:

a) What does an A-instruction do?

b) Draw a diagram of a circuit which will

1) detect that instruction currently emitted from the ROM is an A-instruction and

2) perform the appropriate updates (hint, the diagram on slide 8 of lecture 7 does not contain all the wires for the registers. Look at the register chip diagram on page 49, chapter 3, of the text book.

**Question 2**

Consider the C instruction format:

111a c1c2c3c4c5c6 d1d2d3 j1j2j3

Now look at figures 4.3, 4.4 and 4.5 in chapter 4 of the textbook. Now what is the binary encoding of:

a)  D=M

b)  D;JEQ

c)  D=D+1;JGT

Briefly explain what each of the above commands mean.

**Question 3**

Write Hack machine code that sums 10 consecutive values starting at location:

**array** and stores the sum of these numbers in location: **sum.**Run your program in the CPU emulator.