

SOLUTION NOTES

Computer Design 2002 Paper 3 Question 4 (SWM)

WARNING: These are the solution notes as submitted in January 2002. They may have been updated later but I do not have the updated copy.

- (a) An analogue computer works with continuously varying input signals (analogue voltages or other physical quantity) and performs a hard wired continuous function to compute the output result. In contrast, a digital computer works with quantised input signals (typically binary) and produces similarly quantised output signals. A digital computer typically has a von Neumann architecture which allows for a program to be stored in memory rather than being hard wired.
- (b) A control-flow model of computation present the programmer with a sequential model of instruction execution. A program counter points to the current instruction and is incremented after each instruction is executed. Branch, jump or call instructions cause a break in the sequential flow of control by writing a new value to the program counter.
- (c) Little endian and big endian specify the byte ordering within a word. Example: the 32 bit value 0x12345678 would be laid out in the following order in memory:

address offset	little endian arrangement	big endian arrangement
0x0	0x78	0x12
0x1	0x56	0x34
0x2	0x34	0x56
0x3	0x12	0x78

- (d) Latency of data transmission is the total time it takes to transmit a data value. Bandwidth is the amount of data transmitted per unit time.
- (e) Temporal locality of data predicts that data that has been accessed once is likely to be accessed again. Spatial locality indicates that data which has been accessed once is likely to have its neighbours accessed soon.