

1. RISC & CISC

15 Hardware and Virtual Machines

15.1 Processors, Parallel Processing and Virtual Machines

Candidates should be able to:

Show understanding of Reduced Instruction Set Computers (RISC) and Complex Instruction Set Computers (CISC) processors

Show understanding of the importance / use of pipelining and registers in RISC processors

Show understanding of the four basic computer architectures

Show understanding of the characteristics of massively parallel computers

Show understanding of the concept of a virtual machine

Notes and guidance

Differences between RISC and CISC

Understand interrupt handling on CISC and RISC processors

SISD, SIMD, MISD, MIMD

Give examples of the role of virtual machines

Understand the benefits and limitations of virtual machines

RISC & CISC

RISC - reduced instruction set computer

CISC - complex instruction set computer

Differences between RISC and CISC

CISC	RISC
Many instruction formats are possible	Uses fewer instruction formats
There are more addressing modes	Uses fewer addressing modes
Makes use of multi-cycle instructions	Makes use of single-cycle instructions
Instructions can be of a variable length	Instructions are of a fixed length
Longer execution time for instructions	Shorter execution time for instructions
Multiple register sets	Makes use of general multipurpose registers // fewer registers
It is more difficult to make pipelining work	Easier to make pipelining function correctly

CISC	RISC
The design emphasis is on the hardware	The design emphasis is on the software
Uses the memory unit to allow complex instructions to be carried out	Processor chips require fewer transistors
Has a programmable control unit	Has hard-wired control unit
Make more use of cache and less use of RAM	Make more use of RAM

Interrupt handling in pipelining

- Once the processor detects the existence of an interrupt
- To discard all instructions in the pipelining except for the last instruction in the writeback stage

Past-paper questions

Statement	RISC	CISC
Larger instruction set		✓
Variable length instructions		✓
Smaller number of instruction formats	✓	
Pipelining is easier	✓	
Microprogrammed control unit		✓
Multi-cycle instructions		✓

