

# Worksheet 18.1: for testing basic understanding

- 1 a The specialised instructions could be matched closely to the processor hardware. They could also be matched to the structures and programming constructs present in high-level programming language code.
- b Writing a compiler for a specific processor and for a particular high-level programming language.
- 2 a The operation of the hardware logic is faster than is possible if the firmware (microprogrammed) approach is used.
- b Because a RISC processor has far fewer instructions than a CISC processor and one instruction is executed for each clock cycle, it is relatively straightforward to construct the logic circuit hardware solution.
- 3 The RISC design has several features that are aimed at improving on the performance of a CISC processor. One of the features of a CISC processor is that many different instructions involve memory access. One reason for this is that instructions have varying lengths so one register cannot always store a whole instruction. Another is that a simply expressed instruction can lead to complex programming (this is the main feature that distinguishes a CISC processor, which has complex instructions, from a RISC processor, which has simple instructions). However, memory access is much slower than register access. So, the approach with RISC is to use memory access only when necessary. Whereas a CISC instruction might use memory for temporary storage during the execution of an instruction, the RISC approach is always to use registers.
- 4 RISC processors have instructions all of the same length.  
Each instruction is executed in one clock cycle.

The system has a large number of registers so that a set can be assigned to each of the instructions that are being processed in parallel.

- 5 While a program is being executed, the CPU is receiving a sequence of machine-code instructions. It is the responsibility of the control unit within the CPU to ensure that each machine instruction is handled correctly. There are two ways that a control unit can be designed to allow it to perform its function.

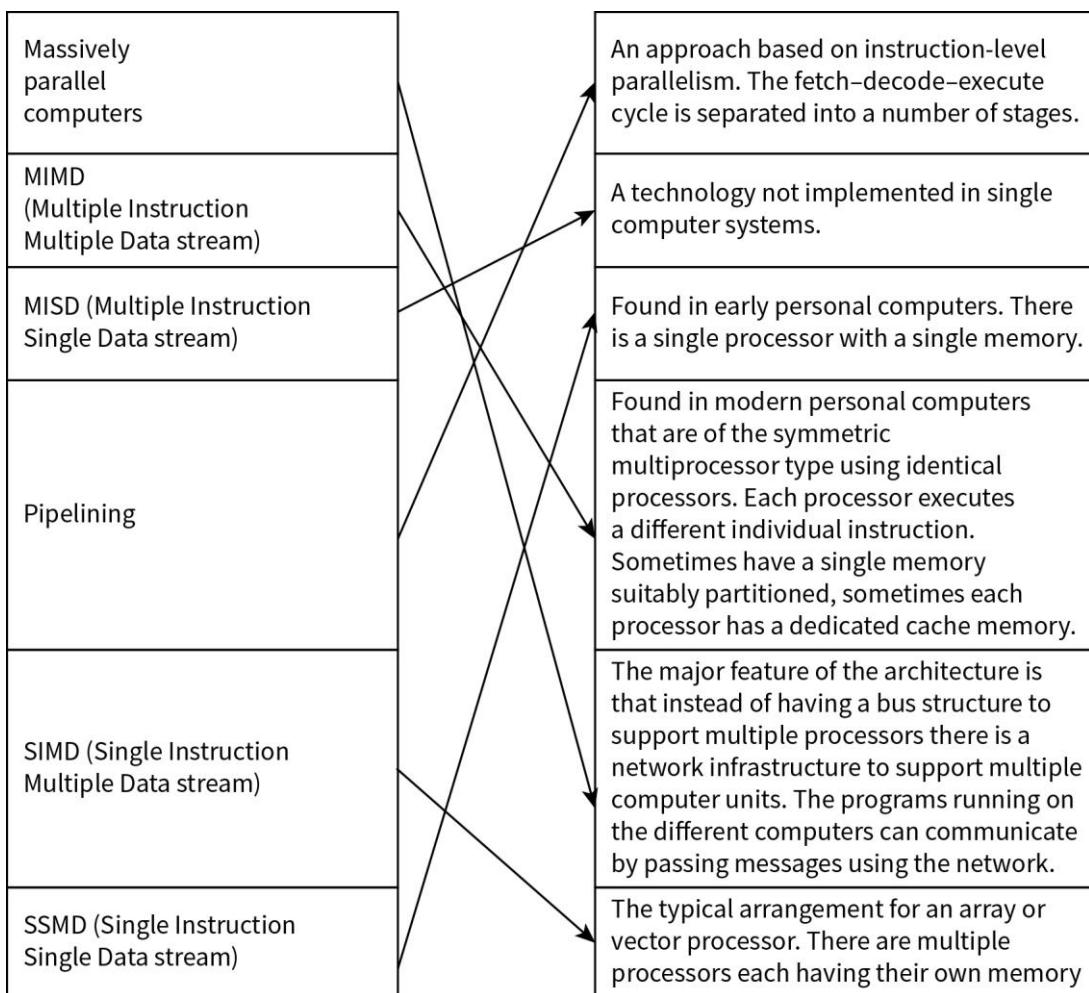
One method is for the control unit to be constructed as a D. This is called the B solution. The machine-code instructions are handled directly by hardware.

The alternative is for the control unit to use A. In this approach, the control unit contains a E component in which is stored the F for microprogramming. This is often referred to as C. The choice of which method is used is largely dependent on the type of processor.

- 6 • A
- B
- B
- B
- A
- A
- A
- B

One point to note is that in RISC the ‘reduced’ applies to many aspects such as complexity, numbers of instructions, number of formats. The one thing that is increased for RISC is the number of registers. This is a requisite for pipelining and is a feature that particularly strengthens the argument for choosing RISC.

7



- 8 a A is an application program  
 b B is a guest OS supporting the execution of A  
 c F  
 d C  
 e B and E  
 f There can be many individual application programs running, each supported by a guest OS which is interacting with a virtual machine specific to that OS.