

1997 Paper 6 Question 1

Processor Architecture

The ARM instruction set (implemented by the ARM 7 processor core) contains a branch-with-link instruction (assembler mnemonic BL) to perform subroutine calls, but no specific instruction for returning from subroutine calls. How may returns be implemented for both complex and trivial subroutines? [8 marks]

A variant of the ARM 7 processor core can execute the conventional 32-bit ARM instruction set and also the 16-bit “Thumb” instruction set. Code compiled with the Thumb instruction set is typically 30% to 40% denser than code compiled with the 32-bit instruction set.

The ARM 7TDMI has a narrow external datapath (16 bits wide) for use in low-end embedded applications. Internally it has a unified cache with a 32-bit datapath. In what circumstances would Thumb code execute faster than the conventional 32-bit instructions? [12 marks]