COMPUTER SCIENCE TRIPOS Part II – 2017 – Paper 7

6 Comparative Architectures (RDM)

(*a*) What features of a processor's instruction set are desirable if a pipelined implementation is planned? [5 marks]

(*b*) The performance of a processor typically improves when a modest number of pipeline stages are created. Why does it become difficult to maintain near linear performance gains with deeper pipelines? [5 marks]

(*c*) Clustered superscalar processors partition functional units into clusters. Data forwarding within a cluster operates as normal allowing dependent instructions to execute on consecutive clock cycles. Communication between clusters normally incurs an additional delay of 1 or 2 clock cycles. The clustering idea may also be extended to include the issue buffer (also known as the issue window).

(*i*) What problem does clustering attempt to solve? [5 marks]

(*ii*) Assume a processor has two symmetric clusters that contain both functional units and an issue buffer. In this processor, instructions must be steered to a particular cluster before they are inserted in an issue buffer. What should the two basic goals of a good steering policy be? [5 marks]