2009 Paper 5 Question 4

Computer Design

(a) For a MIPS-32 processor executing a jump to subroutine, how are state and control passed between the function and the caller? Indicate what state is passed, but details of particular register numbers are not required. [5 marks]

(b) On the MIPS-32 processor the flow of control can be changed using branch or jump instructions, or by three other mechanisms. What are the *three* other mechanisms for changing the flow of control and what are they used for?

[6 marks]

(c) What is a *control hazard* and what hardware and software techniques can be used to resolve control hazards? [5 marks]

(d) Some instruction sets make all instructions conditional (e.g. the ARM) or have conditional move instructions (e.g. IA32). How can these conditional instructions be used to avoid control hazards? [4 marks]