Computer Design

(a) What is a pipeline bubble and why might a branch instruction introduce one or more bubbles? [4 marks]

(b) Explain, with the aid of an example, how conditional instructions may be used to reduce the number of bubbles in a pipeline. [4 marks]

(c) What is the difference between branches, interrupts, software interrupts (initiated by a SWI instruction on the ARM) and exceptions? [8 marks]

(d) What is an imprecise exception and why might a processor designer prefer it to a precise exception mechanism? [4 marks]