2 Computer Design (swm11)

(*a*) In computer architecture, why do we aim to make the common case fast?

[3 marks]

(*b*) If we have a new hardware divider that speeds up division by $2\times$ but results in a 2% drop in processor clock frequency, how frequently does divide need to be used to improve overall performance by 10%?   [3 marks]

(*c*) What properties are used to cache data efficiently?   [3 marks]

(*d*) What is the difference between direct-mapped, fully-associative and set-associative caches?   [3 marks]

(*e*) What cache-line replacement policies are typical for direct-mapped and set-associative caches?   [3 marks]

(*f*) Why are multi-level caches typically used?   [2 marks]

(*g*) What hardware is typically used to make virtual memory efficient?   [3 marks]