All 54 candidates answered question 1, achieving an average mark of 13.50 out of 20. As this average indicates, the question was mostly answered well. Several candidates could not work out precisely what states the cache line for x would take in part d), and many forgot to mention the writeback to memory that is forced when core 2 takes a copy of x from core 1’s cache. Some candidates had difficulty with the final part e)(ii), which asked for a protected version of the code using the ld1 (load linked) and stc (store conditional) instructions.

53 candidates answered question 3, achieving an average mark of 13.36 out of 20. This question was thus also mostly answered well. Almost every candidate got full marks for providing fine-grained locking code for part c)(i), but many candidates were unable to work out which code deadlocks and which does not (or give reasons why).

50 candidates answered question 2, achieving an average mark of 11.44 out of 20. On the whole, this question was thus answered less well than question 1 or question 3. This question was mainly descriptive, so marks were generally lost for providing only partial or inexact descriptions of the things that were asked about. A surprisingly large number of candidates were unable to describe a form of speculation for an ILP pipeline in part b) (the expected answer was branch prediction).

5 brave candidates had a go at answering question 4. They achieved an average mark of 10.10, so this was the lowest mark on average. However, two candidates got close to answering all four parts, and the others looked as though this was the last question they attempted and they had too little time left to do it justice.