

**Feedback on EEE411 Examination, January 2006 (Academic Year 2005-6)****Question 1**

Some people did this question, which relied on knowing the topic rather than being adept in analysis, well. However, some people did mix up various issues from the course. For example, part a) was about control dependencies i.e. conditional jumps but some people gave answers about score-forwarding and register forwarding. That is, data dependency. Similarly, in part b)-c), concerned with reorder buffers, some people confused this dynamic technique, concerned with ensuring results were written to the permanent registers in the correct order and when and if speculative instructions were deemed to have been executed, with an offline technique to re-order instructions at compile-time to reduce/remove dependencies. Part d) relied on a specific piece of knowledge about preserving the state, in flight in the reorder buffer, when an interrupt occurs into the permanent state of the processor.

**Question 2**

Not many people attempted this question and so it is difficult to generalise. The first part was concerned with the number of iterations. It was a bit ambiguous and so I was somewhat generous in marking this section. Recognising that a fp number has a format  $m \times 2^e$  means that the reciprocal is  $1/m \times 2^{-e}$  and the reciprocal operation only applies to  $m$  which is between 0.5 or 1 so  $1/m$  is between 1 or 2. Given that  $x_0$  must be less than  $1/m$  means that it must be less than one. I would have accepted and answer that set  $x_0$  to 1 but would also accept my answer that the minimum value on  $x_0$  is 0.5 in any event, under which conditions  $N=4-\log_2(0.25) = 6$ . People tended to have problems with this section – not even recognising the basic requirements. The design parts of the question were attempted ‘reasonably’ although some people came up with over-complicated solutions, not recognising the simplicity of the design being asked for and the need to ensure that data progressed in synchronism through the datapath. Furthermore, everybody seemed to include a multiplier to deal with the  $\times 2$  case – a simple shift left by one place would have sufficed. Note, assuming that the datapath deals only with the mantissa, no post processing is included in the solution – to renormalize the result – and there was no penalty for omitting this.

**Question 3**

The first parts of this question were attempted quite well – they were book work after all. However, the last part, where a program should be designed – or even roughed out – to sort the data horizontally was more unevenly attempted. The solution, in a sense, was given in the italicised text at the foot of the question: if all columns work simultaneously, it will not work. This is why instructions that allowed the column address LSB to be transferred into a flag, on which conditional instructions rely, were included. Active columns could read in data from an adjacent column, do a conditional swap, and copy data back again. Inverting the flag then allows the other columns to work in the next iteration. The key is never to be able to propagate the same data (i.e. create a copy) in two directions at the same time. I tended to be generous with the marks in this section because I recognised that it was quite difficult and looked more for understanding of this concept rather than perfect program. It is heartening to note, however, that some people did provide near-perfect programs.

**Question 4**

This was relatively similar to a question from a previous year with different steps in the derivations being asked for and with different internal/external communication times. Those who had done their homework did well. For those who had not, it was clear that the derivation, which is not tricky in itself, presented problems. It can be annoying to see derivations that do not flow logically – i.e. a discontinuous step in the middle where tracing forward from the problem and back from the solution meet, and few marks were given for such duplicitous workings.

**General**

I thought that the paper was less well addressed than I had expected. Clearly, some thought was required to get a good mark and this is as it should be for a level 4 paper. Most people had a command of the subject and the bookwork was undertaken well (with notable exceptions). However, it is clear that *application* of this material is less well developed.