**長庚大學 電機工程系(資工領域)博士班資格考 計算機架構試題 2015/03/06**

1. **(20 pts)** Briefly explain the following classifications on parallelism. Please give program examples to explain each type of parallelism.
2. Instruction-level parallelism
3. Data-level parallelism
4. Thread-level parallelism
5. Request-level parallelism
6. **(10 pts)** Explain why the cache memory can speed-up the program execution performance.
7. **(15 pts)** Give an example to explain why a multi-core processor needs cache-coherence protocol.
8. **(15 pts)** Explain how a branch-prediction mechanism speeds up the execution performance of a pipelined processor. Give an example with a sample program to explain the design concept.
9. **(20 pts)** Explain the concepts about data hazard through answering the following questions.
10. What is a data hazard? List all types of data hazards with examples for each hazard.
11. Give a program example to explain how data hazards slow-down the execution of an instruction-level parallel processor.
12. Explain how a compiler overcomes the data hazards to exploit instruction-level parallelism. Give a program example to explain the concepts.
13. Explain how a hardware mechanism overcomes the data hazards to exploit instruction-level parallelism. Draw simple hardware diagram to explain the concepts.
14. **(20 pts)** Briefly explain the design philosophy of RISC (Reduced Instruction Set Computer) processors.