長庚大學資訊工程學系博士班資格考　計算機架構　考題

1. **(15 pts)** Briefly explain why the cache memory within a processor core will improve the program execution performance.

2. **(30 pts)** Explain the following processor design concepts. For each one, give an example of commercial products that falls into this category.
   (a) Instruction-level parallelism
   (b) Thread-level parallelism
   (c) Data parallelism.
   (d) Superscalar processor
   (e) VLIW processor

3. For each of the processor style listed below, give an example to show how a compiler can do to improve the program execution performance. In your answer, you should give an example program and show how the compiler transforms the program to reduce program execution time.
   (a) **(8 pts)** A single pipelined processor
   (b) **(8 pts)** A graphics processing unit (GPU) having vector units.
   (c) **(8 pts)** A processor associated with a data cache.

4. Explain the following concepts about processors design
   (a) **(4pts)** Interrupt
   (b) **(4pts)** Speculative execution
   (c) **(8pts)** How to realize precise interrupt in an out-of-order processor with speculative execution?

5. Discuss the concepts about Moore's law by answering the following questions.
   (a) (**5 pts**) What is Moore's law?
   (b) (**10 pts**) What's the impact to global economy if the scaling trend of Moore's law stops? (There is no clear answer to this question but I want to hear your own opinion.)