

長庚大學 電機工程學系 (資工領域) 博士班資格考 計算機架構考題

1. Briefly explain the basic concepts of virtual memory system by answering the following questions
  - (a) **(6 pts)** What is virtual memory?
  - (b) **(6 pts)** From the programmer's view point, what is the advantage of a computer system with virtual memory?
  - (c) **(8 pts)** List the hardware support required for a virtual memory system.
  
2. **(10 pts)** Briefly explain why the cache memory within a processor core will improve the program execution performance.
  
3. Explain and give an example for each of the parallelism style listed below:
  - (a) **(6 pts)** Instruction-level parallelism
  - (b) **(6 pts)** Thread-level parallelism
  - (c) **(6 pts)** Data parallelism
  
4. For each of the processor style listed below, give examples to show how a compiler may 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 VLIW processor
  - (c) **(8 pts)** A processor associated with a data cache.
  - (d) **(8 pts)** A multi-core processor executing a sequential program.
  - (e) **(8 pts)** A sequential processor associated with a general-purpose GPU (graphics processing unit)
  
5. **(12 pts)** Explain why a multi-core processor needs a cache coherence protocol.