

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. **(10 pts)** Briefly explain why the cache memory within a processor core will improve the program execution performance.
2. For each of the processor style listed below, give examples 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 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)
3. **(10 pts)** Explain the difference between superscalar and VLIW (Very Long Instruction Word) processors. Give application scenarios (practical industry applications) for the two kinds of processors.
4. **(20 pts)** Give an example, with a program fragment and the pipeline behavior, to explain why branch prediction may improve the performance of a pipelined processor.
5. **(20 pts)** There are some challenges when applying the parallel processing techniques to computer architecture (e.g., parallel processors) design. List any two of challenges and explain why they are indeed the challenges.