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10CS74

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018

Advanced Computer Architectures

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART - A

- 1 a. What do you mean by instruction set Architecture (ISA)? Briefly explain the various dimensions of ISA addressed during defining the computer architecture. (10 Marks)
- b. Assume a disk subsystem with the following components and MTTF.
 - * 10 disks each rated at 1,000,000 hr MTTF
 - * 1 SCSI controller, 500,000 - hour MTTF
 - * 1 Power supply, 200,000 - hour MTTF
 - * 1 Fan, 200,000 - hour MTTF
 - * 1 SCSI cable, 1,000,000 - hour MTTF

Using the simplifying assumptions that the lifetimes are exponentially distributed and that failure are independent, compute the MTTF of the system as a whole. (06 Marks)
- c. Write note on the performance equation of processor. (04 Marks)
- 2 a. Enlist the pipeline hazards. Also explain them. (10 Marks)
- b. With an aid of a neat functional diagram, discuss the classic 5 - stage pipeline for a Risc processor, that highlight how an instruction flows through the data path. (10 Marks)
- 3 a. What do you mean by loop unrolling? Explain the significance of it. Further, discuss the various types of limits to the gains that can be achieved by loop unrolling. (10 Marks)
- b. What is dynamic prediction? Draw the state transition diagram for a 2-bit prediction scheme and explain. (07 Marks)
- c. Compare and contrast the correlating predictors and Tournament predictors. (03 Marks)
- 4 a. Briefly discuss the different strategies employed to exploit Instruction Level Parallelism (ILP) using multiple issue and static dynamic scheduling. (10 Marks)
- b. Discuss how the following advanced techniques are useful in enhancing the performance of ILP :
 - i) Branch target buffers
 - ii) Speculation
 - iii) Value prediction. (10 Marks)

PART - B

- 5 a. Suppose you want to achieve a speedup of 80 with 100 processors. What fraction of the original computation can be sequential? (06 Marks)
- b. Discuss the directory - based cache coherence protocol in a distributed memory multiprocessor, indicating the state transition diagram explicitly. (07 Marks)
- c. What do you understand by memory consistency? Explain furthermore, discuss how relaxed consistency models allow reads and write to complete out of order. (07 Marks)

- 6 a. Briefly explain the six basic cache optimization employed to improve cache performance. (09 Marks)
- b. Indicate the distinguish features of the following techniques employed to improve cache behavior.
- i) Compulsory misses
 - ii) Capacity misses
 - iii) Conflict misses
- (06 Marks)
- c. In brief, discuss the four memory hierarchy questions for virtual memory. (05 Marks)
- 7 a. Briefly explain the eleven advanced optimizations of cache performance. (12 Marks)
- b. Explain how the protection of processes is accomplished via the following :
- i) Virtual memory
 - ii) Virtual machines.
- (08 Marks)
- 8 a. Discuss how software pipelining and trace scheduling techniques are useful in uncovering the parallelism among instructions by creating longer sequences of straight sine code. (10 Marks)
- b. Explain the five different execution-unit types in the IA-64 architecture, that hold the corresponding instruction classes. (10 Marks)
