Question Paper

Exam Date & Time: 30-Apr-2024 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal
Second Semester Master of Engineering - ME (Embedded Systems) Degree Examination - April / May 2024

Multicore Program Optimization Elective -2 [ESD 5235]

Marks: 100 **Duration: 180 mins.**

Tuesday, April 30, 2024

Answer all the questions.

1) Q1) (10)
What do you understand by SIMD and MIMD? Explain. Also differentiate between fine grain parallelism and coarse grain parallelism. {CO1} {TL2}
- (6)+(4) = (10)m

2) Q2) (10)
List all the 5 stages of instruction execution in the DLX machine. Explain each stage by considering a Register instruction as well as a Branch instruction. {CO1} {TL2}
- (10)m

3) Q3) (10)
What is the meaning of pipelining in general? List and explain the various kinds of hazards seen during instruction pipelining? {CO1} {TL2}
-(3)+(7)=(10)m

4) Q4) (10)
Explain the term principle of locality and its two kinds. Also explain the meaning of Direct memory mapping technique. What is the advantage of this technique compared to the other mapping techniques? {CO2} {TL3}
-(5)+(5)=(10)m

5) Q5) (10)
(i) Differentiate between a split cache and a unified cache. (ii) Determine which cache has a lower miss rate: a 16 KB instruction cache with a 16 KB data cache, or a 32 KB unified cache? What is the average memory access time in each case?
(Assume a hit takes 1 clock cycle and a miss penalty is 50 clk cycles. Also a load or store takes 1 extra clk cycle on a
unified cache. Also for the 16 kB instruction cache, miss rate is 0.64% and for the 16 KB data cache it is 6.47% and for the unified cache it is 1.99%) {CO2} {TL3}
- (3)+(7) = (10)m

6) Q6) (10)

Differentiate between Set Associative mapping and Fully Associative mapping. Which mapping is better and why?
{CO2} {TL3}
- (7)+(3)=(10)m

7) Q7) (10)

Expalin the MESI protocol. Which protocol is better in your opinion, MESI or MSI, and why? {CO2} {TL3}
- (7)+(3)=(10)m

8) Q8) (10)

In general on what basis do you consider the total number of threads needed to execute a code block? Justify your answer. Also list the openMP routines used for (i) creating threads (ii) determining the id of a thread (iii) determining the total processors in the system. {CO3}{TL3}
-(4)+(6)=(10)m

9) Q9) (10)

In what cases should you go for a programming loop and in what cases should you avoid using a loop in your code? Also explain the terms Loop Unrolling, and Loop Interchanging with a suitable example each. {CO3} {TL3}
- (2) + (8) = (10)m

10) Q10) (10)

What do you understand by software profiling methods? List their types and explain. Also in general how can you measure the time taken to execute a piece of code in a "c" program? {CO3} {TL3}
- (6) + (4) = (10) m

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