MONASH University

Lecture Revision

OBJECTIVES

- Revise the materials and deepen the understanding of Week 8 to 9 lectures.

MARKS

- The applied session is worthed 4 of the unit final mark.

INSTRUCTIONS

1. **Preparation is required for this Applied session.** Please do NOT plan to complete the Applied preparation during the Applied class. **Late penalty** (5% per day) will apply if you submit late!
2. The purpose of these **flipped Applieds** is for students to get an opportunity to test their understanding of lecture/pre-reading material with a low cost in lost marks if they have not understood the material, rather than not understanding the material.
3. Students should produce **written answers** to the Applied questions prior to starting the Applied.
4. Students must submit their answers via Moodle in **PDF format** before their allocated class.
5. Students' answers will be reviewed in a question and answer format during the Applied. Each student will explain their answer.
6. For many of the questions, marks will be allocated for **both the correctness of the written answer and the correctness & clarity of the verbal answer.** Therefore, plan also for a brief 60 seconds summary explanation of each question. Try to focus on the most important and critical idea in the answer. Marks will be awarded on the student's ability to explain their submitted answers in the PDF: concise, focused and accurate answers will earn full marks, answers with errors and lengthy explanations will lose marks. Read the marking rubric for detailed instructions.
7. All questions are based on lecture/pre-reading slides, and lecture/pre-reading slides are in effect the answer sheets for these Applieds.
8. Worked answers will not be posted after Applieds as most of the answers are already in the lecture/pre-reading slides and discussed in the class.
9. Marks will not be awarded if you skip the class, or do not make any submissions, or make an empty submission to Moodle (unless a special consideration extension has been approved).
10. You are allowed to use AI tools to search for information and resources during pre-class preparation. **You must declare in your report!** AI tools are not allowed during the interview.

11. Certain tasks may be selected to be interviewed as a group during the in-class presentation/interview session. However, all the tasks are still individually assessed based on your Moodle submission and your own oral interview performance.

Questions

Answer all the following questions.

Question 1 [GPU/NPU] (30%):

A) Explain the differences between a GPGPU/GPU and a CPU in terms of: i) number of cores, ii) core complexities, iii) memory bandwidth, and iv) ILP exploitation.
B) With the aid of an illustration/diagram, explain how data can be transferred between the memory (e.g., DDR5 SDRAM) of a machine and the memory (e.g., GDDR5) of a GPU.
C) Explain the simple processing & data flow of a CUDA programming model (i.e., from CPU to GPU and vice versa), based on an application that is ideal for GPU parallelization. You may re-use the diagram in part B) to help you answer the question.

Question 2 [Clock synchronisation] (30%):

A) Discuss three reasons why distributed systems need to synchronise time.
B) Discuss the difference between logical clock and real clock synchronization. You are highly recommended to search and refer to any peer reviewed publications/textbooks.
C) Draw diagram(s) similar to the diagram in page 25 of Week 9 (Part A) lecture to explain why the logical time in Lamport's Clock Algorithm cannot be used to deduce the ordering of events.

Question 3 [Deadlock & Mutual Exclusion] (40%):

A) Draw a resource allocation graph to showcase a deadlock scenario, and use the graph to explain the four necessary conditions for deadlock to occur.
B) Draw a wait for graph and discuss the relationship between the Chandy-Misra-Haas algorithm and the wait for graph in the context of deadlock identification. Explain how Chandy-Misra-Haas algorithm works based on the wait for graph.
C) Explain how false deadlocks would happen with the centralized algorithm, based on a resource allocation graph.