

## 并行与分布式计算导论 作业 1

### PDC 2022s Homework 1

截止日期 2022 年 4 月 2 日 23:59

DDL: 2022 Apr. 2 23:59 (GMT+8)

#### 一、 问答题

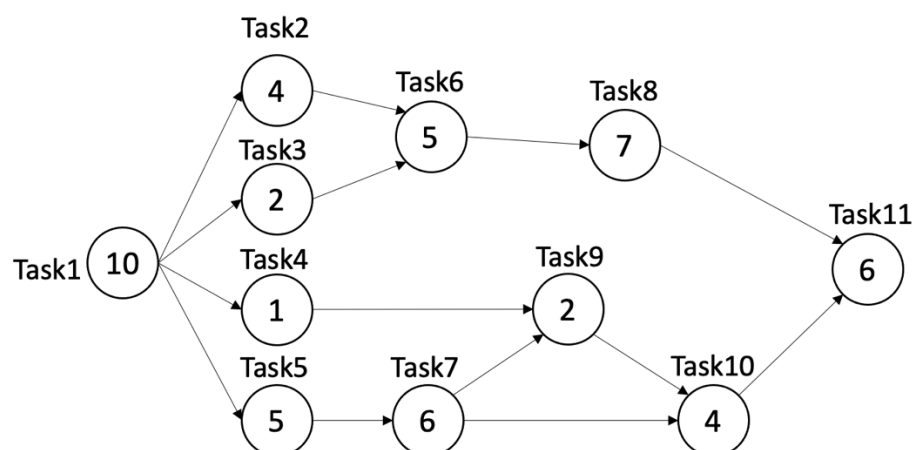
##### A. Short Answers

1. 一个程序串行执行时, 95% 的执行时间花费在了可并行化的函数上。请计算, 该程序使用 10 个处理器并行执行时, 能达到的最大加速比是多少。

When a program is executed serially, the parallelizable functions take 95% of the execution time. What is the maximum speedup that can be achieved when the program is executed in parallel with 10 processors?

2. 根据所示的任务依赖图, 回答下列问题。

According to the task dependency graph shown, answer the following questions.



圈内表示该任务执行所需的时间。

The number in the circle represents the execution time of the task.

- (1) 请指出该任务依赖图的关键路径;

What is the critical path of the task dependency graph?

- (2) 请指出该任务的最大并行度; 并计算若达到最小运行时间, 需要的处

理器数量;

What is the maximum parallelism of this task? Calculate the number of processors required if the minimum execution time is reached.

(3) 试计算,使用 2 个和 3 个处理器时,分别的并行效率(parallel efficiency)。

Calculate the parallel efficiency when the program is executed in parallel with 2 and 3 processors respectively.

问答题目要求提交答案, 可与编程题目报告合并在一个文档中。

## 二、 编程题

### B. Programming

利用 **OpenMP** 并行编程,

Programming in **OpenMP**,

3. 编写“计算  $\pi$  值”的并行代码, 并尝试使用不同的线程数进行测试。串行代码见附件。

Finish the program: “calculate  $\pi$ ”. Test with different number of threads. The serial version attached.

4. 不使用 reduction 子句, 完成“计算  $\pi$  值”的并行代码。需要验证并行程序的正确性, 但不要求性能比较。

Finish the program: “calculate  $\pi$ ” **without** using the *reduction* clause. Verify the correctness of this version.

5. 了解 PSRS 算法及其原理, 实现 PSRS 算法的串行和并行版本, 尝试使用不同的线程数和问题规模进行测试。参考 psrs-algo.pdf。

Finish the parallel version of PSRS algorithm. Test with different numbers of threads and problem scales.

编程题目要求**提交代码和报告**, 报告内容应包括编程思路、测试结果与分析。

请在课程服务器中建立文件夹 hw1, 并将问答题目答案与编程题题目代码和报告上传至改文件夹。

The Programming part needs **code and a report** in submission. And the report content should include programming ideas, test results, and analysis.

Please create a directory named "hw1" on the course machine, and upload your answer, code and report to the directory.