

4.3 Parallel and Distributed Computing

Name: _____ Class: _____ Date: _____

Total: 10 marks

KEY WORDS parallel 并行 • sequential 顺序 • speedup 加速比 • distributed 分布式
• distributed computing 分布式计算

Objective

Build the skills to answer exam questions on **parallel and distributed computing**.

You must be able to:

- distinguish **sequential** 顺序 from **parallel** 并行 computing
- explain how **distributed** 分布式 computing spreads a task across computers
- calculate the **speedup** 加速比 from parallel processing
- explain why speedup is limited by the parts that must run sequentially

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Sequential vs parallel

Sequential computing runs steps one after another; **parallel** computing runs steps **at the same time** on multiple processors.

■ Distributed computing

Spreads a task across **multiple computers** working together.

■ Speedup

$$\text{speedup} = \frac{\text{sequential time}}{\text{parallel time}}.$$

A 60 s job done in 20 s has a speedup of 3. Speedup is **limited** by the parts that must still run sequentially.

2 Practice

2.1 State the difference between sequential and parallel computing. [2]

2.2 A task takes 40 s sequentially and 10 s in parallel. Find the speedup. [2]

2.3 State what distributed computing does. [1]

3 Exam-style questions

3.1 Parallel computing runs steps [1]

- | | |
|---|---|
| A | B |
| C | D |
- A** one after another
B at the same time
C never
D in random order

3.2 Speedup is [1]

- | | |
|---|---|
| A | B |
| C | D |
- A** parallel time – sequential time
B sequential time $\div$ parallel time
C parallel $\times$ sequential time
D always 1

3.3 A job takes 100 s on one processor and 25 s split across four.

(a) Find the speedup. [2]

(b) State what limits parallel speedup. [1]