

## 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]

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

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**2.3** State what distributed computing does. [1]

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## 3 Exam-style questions

**3.1** Parallel computing runs steps [1]

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

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**3.2** Speedup is [1]

- **A** parallel time – sequential time
- **B** sequential time ÷ parallel time
- **C** parallel × sequential time
- **D** always 1

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**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]

## Solutions

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**2.1** sequential runs steps one after another; parallel runs steps at the same time.

**2.2**  $\text{speedup} = \frac{40}{10} = 4$ .

**2.3** it spreads a task across multiple computers.

**3.1 B.**

**3.2 B.**

**3.3** (a)  $\frac{100}{25} = 4$ . (b) the parts of the task that must run sequentially.