AP COMPUTER SCIENCE PRINCIPLES • EXERCISE SHEET

4.2 Fault Tolerance

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

Objective

Build the skills to answer exam questions on **fault tolerance**.

You must be able to:

- explain how **fault tolerance** 容错 lets a system keep working when part fails
- describe how **redundancy** 冗余 supports fault tolerance
- explain why the Internet is fault tolerant
- identify a **single point of failure** 单点故障

1 Worked examples

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

■ Fault tolerance

A **fault-tolerant** system keeps working even when **part of it fails**.

■ Redundancy

Redundancy —having more than one path or copy —supports fault tolerance. The Internet is fault tolerant because packets can take **alternate routes** when a path goes down.

■ Single point of failure

A **single point of failure** is one component whose failure brings down the whole system. Redundancy removes it, but at extra **cost**.

2 Practice

2.1 Define fault tolerance. [1]

2.2 State how redundancy supports fault tolerance. [1]

2.3 Define a single point of failure. [1]

---

3 Exam-style questions

3.1 Fault tolerance lets a system [1]

- **A** fail completely
- **B** keep working when part of it fails
- **C** run faster
- **D** compress data

3.2 The Internet is fault tolerant because packets can [1]

- **A** take alternate routes
- **B** be deleted
- **C** be encrypted
- **D** be sorted

3.3 A network has only one cable connecting two cities.

(a) Name this weakness. [1]

(b) State how to make the connection fault tolerant. [1]

(c) State the trade-off of adding redundancy. [1]

4 Go further

- work through the **4.2 Fault Tolerance** lesson on the **Learn** page;
- read the **Computer Systems and Networks** section of the AP Computer Science Principles handout on the **Know** page.

Solutions

2.1 the ability of a system to keep working when part of it fails.

2.2 it provides more than one path or copy, so a backup takes over when one fails.

2.3 a single component whose failure brings down the whole system.

3.1 B.

3.2 A.

3.3 (a) a single point of failure. (b) add a second (redundant) path or cable. (c) the extra cost of the redundancy.