8.2 Database Management Systems (DBMS)

Name: _____ Class: _____ Date: _____ **Total: 17 marks**

KEY WORDS database management system (dbms) • data dictionary • logical schema • integrity • query

Objective

Build the skills to answer exam questions on the **Database Management System (DBMS)** – the features it provides and the tools it gives users.

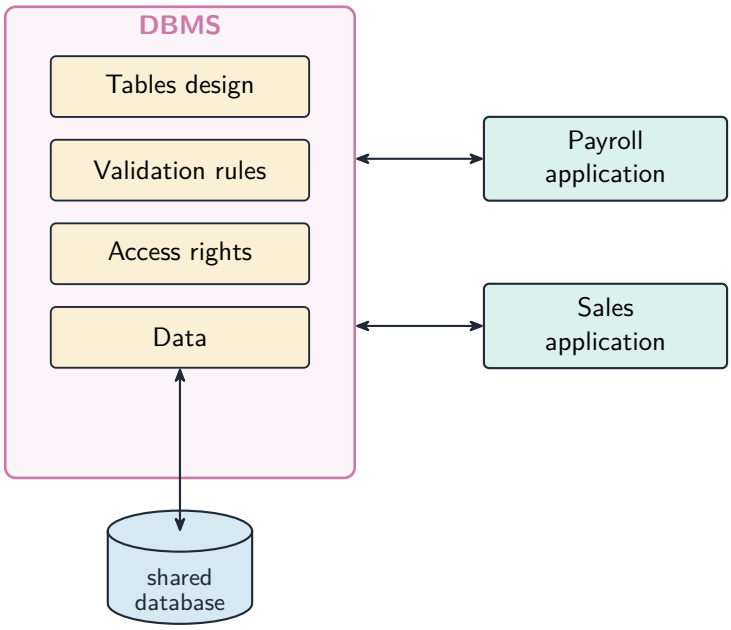
You must be able to:

- describe the features of a DBMS that fix the problems of a file-based approach
- describe how the software tools in a DBMS are used in practice

1 Key knowledge and worked examples

■ One database, several users

A **Database Management System (DBMS)** is the software that defines, stores, retrieves and controls access to the database. The database is the stored data and structure; the DBMS is the software managing it.



Use the school-club database from sheets 8.1 and 8.1.1: STUDENT, CLUB and MEMBERSHIP. A **logical schema** describes its tables, fields, keys and relationships. It describes the design, rather than listing all the current student records.

Worked example: from a problem to a DBMS response

- **Two club files disagree about Mei's email.** Store her contact details once in STUDENT and use key references from MEMBERSHIP. The design reduces redundant copies and the risk of inconsistent updates.
- **An entry refers to student S9, who is missing.** A foreign-key constraint rejects that membership. This enforces referential integrity; it does not prove that a real person's details are true.
- **Two staff members update the last available club place.** Concurrency control, such as locking or suitable transaction isolation, prevents their updates from interfering. A **transaction** groups related changes so they all succeed or all fail.
- **A student should see club names but not other students' telephone numbers.** Grant access rights to the permitted data, perhaps through a restricted **view**. A view presents selected data from the underlying tables.
- **A disk fails.** Restore a tested backup and apply the recovery procedure. Backups protect availability; access rights restrict who can read or change data.

Worked example: read a data dictionary

A **data dictionary** stores metadata: descriptions of fields, types, sizes, keys and constraints. This entry describes a field, not a particular membership.

Property	MEMBERSHIP.StudentID
Data type	VARCHAR(6)
Null allowed	No
References	STUDENT.StudentID
Key role	Part of composite primary key; foreign key

The logical schema gives the overall design. The dictionary supplies details about the objects in that design.

Worked example: follow a query through the tools

A **developer interface** lets a developer define tables, constraints, forms or queries, using facilities such as an SQL editor. For example, the developer declares the MEMBERSHIP foreign key through this interface.

The **query processor** receives a query, checks and interprets it, plans how to retrieve the data and executes it. For a query requesting Chess members, it uses the related tables to return matching records. The interface is where the developer works; the processor carries out the query.

Other tools include a forms designer for data-entry screens and a report generator for formatted output. Choose a tool by its job, rather than memorising its name alone.

2 Practice

Now apply the methods above.

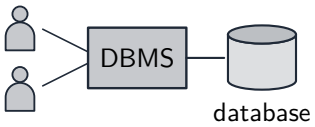
2.1 State what a **data dictionary** holds. [1]

data dictionary

2.2 State what a **transaction** is. [1]

transaction

2.3 State **two** features a DBMS manages centrally for a shared database. [2]

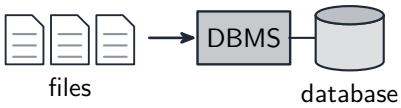


2.4 State what a **view** is. [1]

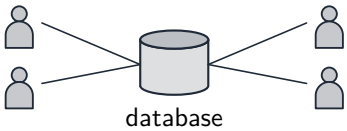
view

3 Exam-style questions

3.1 Describe **two** features of a DBMS that solve problems of the file-based approach. [4]



3.2 Explain how a DBMS allows many users to work on the data at the same time **safely**. [2]



3.3 Describe the roles of the **developer interface** and **query processor** when a programmer writes and runs a query. [4]

DBMS

3.4 Describe what is meant by the DBMS feature **data dictionary** and the DBMS feature **logical schema**. [2]

data dictionary logical schema