

The
Management
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CERTIFICATE UNIVERSITY EXAMINATIONS
SCHOOL OF SCIENCE AND TECHNOLOGY (SST)
CERTIFICATE IN BUSINESS INFORMATION
COMMUNICATION TECHNOLOGY/ CERTIFICATE IN
INFORMATION COMMUNICATION TECHNOLOGY

**CBT 102/CIT 102: INTRODUCTION TO DATABASE
MANAGEMENT**

DATE: 27TH JULY 2026

DURATION: 2 HOURS

**MAXIMUM MARKS:
70**

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **FOUR** questions.
6. Question **ONE** carries **30 MARKS** and the rest carry **10 MARKS** each.

7. Write all your answers in the Examination answer booklet provided.

QUESTION ONE

Read the Case Study below carefully and answer the questions that follow:

Karibu Hospital has served patients in western Kenya for over 25 years. For most of its history, the hospital used manual file-based systems to manage patient registration, doctors' schedules, pharmacy records, and billing. Each department maintained its own records independently. This caused frequent problems: lost files, duplication of patient information, mismatched billing, and delays in generating medical reports.

In 2022, the hospital management decided to transition to a Database Management System (DBMS) using MySQL. The IT department began by identifying key entities such as Patient, Doctor, Appointment, Ward, and Pharmacy. Using Entity-Relationship (E-R) modeling, they designed an ER diagram that captured relationships: patients book appointments with doctors, doctors issue prescriptions, and pharmacies dispense drugs linked to each prescription.

The IT staff converted the E-R model into relational tables with primary and foreign keys. For example, PatientID served as a primary key in the Patient table and as a foreign key in the Appointment table. They also created a data dictionary to describe table structures, attributes, and relationships. During implementation, normalization was applied up to Third Normal Form (3NF) to eliminate redundancy. For instance, drug details were separated into a Pharmacy table to avoid anomalies in prescriptions. Staff were trained to use DBMS languages: DDL for creating tables, DML for inserting and updating patient records, and DCL for controlling user privileges.

Despite these improvements, challenges arose. Nurses and doctors had little training in databases, leading to errors when inputting records. Security concerns also emerged: administrators worried about SQL injection attacks and unauthorized access to patient data. The IT team responded by implementing role-based access, limiting doctors to patient data only within their wards, and encrypting sensitive medical records.

The hospital board is now evaluating whether the DBMS investment has improved service delivery, reduced medical errors, and ensured data security. They also wonder how data independence and the three-schema architecture can make future system upgrades easier.

Required:

- a) Compare the file-based system previously used and the new DBMS approach at Karibu Hospital.
(8 MARKS)
- b) Explain how E-R modeling, primary keys, and foreign keys supported the hospital's database design. **(7 MARKS)**
- c) Discuss the role of normalization in eliminating redundancy and anomalies in the hospital's system.
(7 MARKS)
- d) Evaluate how DBMS functions and security measures improved operations at Karibu Hospital.
(8 MARKS)

QUESTION TWO

- a) Discuss three advantages of DBMS over file processing systems, with relevant examples.
(5 MARKS)
- b) Discuss two disadvantages of DBMS compared to file processing systems, with examples.
(5 MARKS)

QUESTION THREE

- a) Differentiate between schemas and instances in a database system, using examples. **(5)**

MARKS)

- b) Explain the importance of data independence in DBMS, highlighting its impact on system upgrades.
(5 MARKS)

QUESTION FOUR

- a) Explain the role of the data dictionary in managing databases. **(5 MARKS)**
- b) Identify and describe three types of database users and their responsibilities.
(5 MARKS)

QUESTION FIVE

- a) Define functional dependency with an example in a student records system.
(4 MARKS)
- b) Explain how functional dependencies guide the process of normalization in DBMS.
(6 MARKS)

QUESTION SIX

- a) Identify and explain three relational algebra operations.
(6 MARKS)
- b) Write their SQL equivalents in MySQL (e.g., SELECT, PROJECT, JOIN).

(4

MARKS)