

**061006T4ICT**

**ICT TECHNICIAN LEVEL 6**

**IT/OS/ICT/CR/7/6**

**MANAGE DATABASE SYSTEMS**

**NOV/DEC 2023**



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION  
COUNCIL (TVET CDACC)**

**WRITTEN ASSESSMENT**

**TIME: 3 Hours**

**CANDIDATE INSTRUCTIONS**

1. This paper has TWO sections A and B. Attempt questions in each section as per instructions given in the section.
2. You are provided with a separate answer booklet.
3. Marks for each question are indicated in the brackets.
4. Do not write on the question paper

**This paper consists of 4 printed pages**

**Candidates should check the question paper to ascertain that all  
pages are printed as indicated and that no questions are missing**

**SECTION A: 40 MARKS**

***Answer ALL questions in this section.***

1. Databases consist of several key components that work together to organize, manage, and access data efficiently. State FOUR such components. (4 Marks)
2. SQL commands are often categorized based on the type of operation they perform within a database. Outline the FOUR types of these commands. (4 Marks)
3. A good database system is crucial for efficiently managing and storing data, ensuring data integrity and providing reliable and secure access to information. Outline FOUR characteristics one would consider to achieve this. (4 Marks)
4. In the context of a database, differentiate between *database schema* and *database instance*. (4 Marks)
5. In SQL, the ALL operator is used in conjunction with certain comparison operators to compare a value with all values in a set. State THREE statements that are usually associated with SQL ALL operator. (3 Marks)
6. Define the term *variable* in databases. (2 Marks)
7. The database testing process typically involves several key steps to ensure the accuracy, reliability and performance of the database system. Outline the THREE step database test process. (3 Marks)
8. Transaction mechanisms and concurrency mechanisms are essential aspects of database management systems (DBMS) that ensure data consistency and enable efficient multi-user access to the database. Differentiate between *transaction mechanisms* and *concurrency mechanisms*. (4 Marks)
9. ***Derived*** and ***stored*** are examples of data attributes used in a database, Outline TWO differences between the two. (4 Marks)
10. Define the term database dictionary. (2 Marks)
11. Normalization is a process in database design that organizes tables and attributes in a database to minimize redundancy and dependency. Outline FOUR advantages of normalization. (4 Marks)
12. In database design, relationships are used between different tables to represent how the data in one table is related to the data in another. State TWO types of database relationships. (2 Marks)

**SECTION B: 60 MARKS***Attempt any THREE questions in this section.*

13.

- a) Table 1 shows employee records stored in a database. Use it to answer the question that follows.

Employee No	First name	Last name	Date employed	Salary	Grade
1010	Walter	Williams	11/11/2009	10000.09	Lower
1011	Jane	Antony	09/11/2007	20000.56	Higher
1012	Nicholas	Kings	06/06/2008	25000.67	Higher
1013	Mary	Anne	05/10/2008	15000.45	Middle
1014	Johnstone	Pielly	12/12/2009	11000.99	Lower

Table 1: Employee

Write SQL statements that would:

- i) Extract the first names in uppercase and last names; (3 Marks)
  - ii) Extract the first three characters of the *Grade* and store them in a field named *grade 1*; (3 Marks)
  - iii) Determine the number of characters in the *last name* and store them in the field named *last name size*; (3 Marks)
  - iv) Round off the values in the salary field to 0 decimal places and store them in the field named *sal*. (3 Marks)
- b) Transaction processing involves the management of transactions that consist of multiple operations on a database. Explain the acronym **ACID** as used in transaction processing. (8 Marks)

14.

- a) Database backups are essential for data protection and recovery in the event of data loss, corruption, or system failures. Explain THREE types of databases back up (6 Marks)
- b) Rules and guidelines are used to define the allowable characteristics and relationships of data in database tables. Explain TWO advantages of constraints in a database. (4 Marks)
- c) Database design methodology involves a systematic approach to creating a database structure that meets the requirements of an organization or application. Discuss THREE main phases of database design methodology. (6 Marks)

- d) Distributed systems are composed of multiple autonomous computers that communicate and coordinate their actions through a network and designed to provide a unified service. Outline FOUR characteristics of such system. (4 Marks)
- 15.
- a) In the context of database design, *an atomic attribute* and *multivalued attribute* are types of attributes that represent different characteristics of data. What is their difference? (4 Marks)
- b) Describe THREE constraints used to enforced data consistency in database relationship. (6 Marks)
- c) You have been contracted to create a library system for ABC College. In this system, a student is identified by a Student number and name. A student can borrow a maximum of three books. Each book is identified by an ISBN and BookName. Many students can borrow many books. Every borrow transaction is recorded using StudentNo, Date Borrowed and Return date. Identify the entities in this system and the respective attributes. (10 Marks)
- 16.
- a) The following car details are to be entered in a database: Make, date of manufacture, color and cost.
- i) Prepare a suitable database structure showing field names and their field types. (5 Marks)
- ii) Explain how one can index the data such that cars of the same make and colors are together. (2 Marks)
- iii) Write statements that can be used to select cars of the color green whose cost is greater than Ksh. 500,000. (3 Marks)
- b) Salim intends to perform tests on the data in a database system. Explain any THREE types of database tests that he can perform. (6 Marks)
- c) Juma works for a data company that has been storing their files using physical files. The company intends to switch to using a database management system to store their data. Explain TWO benefits the company may realize from implementing the new system. (4 Marks)

**THIS IS THE LAST PRINTED PAGE.**