

**MURANG’A UNIVERSITY COLLEGE**

***(A constituent college of Jomo Kenyatta University of Agriculture and Technology)***

**UNIVERSITY EXAMINATIONS 2015/2016**

**YEAR ONE SEMESTER I EXAMINATION FOR THE CERTIFICATE IN INFORMATION TECHNOLOGY**

**SCI 0113: DATABASE SYSTEMS MARKING SCHEME**

**DECEMBER 2015**

**SPECIAL MARKING SCHEME**

**Question One ( 30 marks)**

1. Distinguish between authentication and authorization (4 marks)

Authentication is the mechanism whereby systems may securely identify their users.

Authorization is the mechanism by which a system determines what level of access a particular user should have to resources controlled by the system.

1. Describe the following types of database integrity
2. Entity integrity (2 marks)
3. Referential integrity (2 marks)
4. Domain integrity (2 marks)

Entity integrity - the rule states that every table must have its own primary key which is unique and must not be null.

Referential integrity – the rule states that the foreign key value can be in two states. The first state is that the foreign key value would refer to a primary key value of another table, or it can be null.

Domain integrity – specifies that all columns in relational database must be declared upon a defined domain. The primary unit of data in the relational data model is the data type. Domain is a set of values of the same type.

1. Distinguish between a database and database management system. (4 marks)

A database is a mechanism that is used to store information or data in an organized manner while DBMS is the software that allows users to define, create and maintain a database and provides controlled access to the data.

1. Describe characteristics of a stand alone computer (6 marks)

* Database(or files) reside on a PC – on the hard disk
* Applications run on the same PC and directly access the database
* Business rules are enforced in the applications running on the PC
* Only a single user accesses the applications

1. Distinguish between distributed database and replication server (4 marks)

A distributed database management system is software that manages the database and provides an access mechanism that makes this distribution transparent to the users. Allows client applications to access data on multiple database servers throughout an enterprise, even geographically dispersed enterprises. While Replication server provides multiple copies of data, clients can rely on their own local data instead of remote, centralized databases and minimizes performance and data availability problem typically associated with remote access in distributed systems.

1. Explain the roles of the following personnel in a database systems environment ( 6 marks)

1. **Database administrators:**

Responsible for authorizing access to the database, for coordinating and monitoring its use, acquiring software and hardware resources, controlling its use and monitoring efficiency of operations.

1. **Database Designers:**

Responsible to define the content, the structure, the constraints, and functions or transactions against the database. They must communicate with the end-users and understand their needs.

1. **Casual end-users**: occasionally access the database, but they may need different information each time.
2. **Naive or parametric end-users**: constantly update and query databases, using standard types of queries and updates.

**Question two ( 20 marks)**

1. Explain **four** problems caused by redundancy in a database (4 marks)

* Data integrity is compromised for example when data is deleted others are left
* Accessing data is confusing
* Updating of the database becomes a problem
* Speed of operation is slow
* The system takes up a lot of storage

1. With the aid of a diagram in each case, distinguish between hierarchical and a relational database model. (6 marks)

A **hierarchical database** consists of a collection of records that are connected to each other through *links*. A record is similar to a record in the network model. Each record is a collection of fields each of which contains only one data value. A link is an association between precisely two records.

A **relational database** is database that has a collection of tables of data items, all of which is formally describes and organized according to the relational model. Data in a single table represents a relation from which the name of the database type comes.

Difference @ 4 marks

Diagrams @ 2 marks

1. Describe any four properties of relational tables (8 marks)

* The table has a name that is distinct from all other tables in the database
* Each cell of the table contains exactly one value
* Each column has a distinct name
* The value of a column are all from the same domain
* The order of columns has no significance in other words provided a column name is moved along with the column values, we can interchange columns.
* Each record is distinct there are no duplicate records

1. Differentiate between logical and physical data independence. (2 marks)

* Logical Independence
  + Capacity to change conceptual schema without affecting external view (application programs)
* Physical Independence
  + Ability to change internal schema without changing the conceptual view

**Question Three (20 marks)**

1. Kenny designed a database and she realized that there was breach of security of the database of the organization. Outline four measures that he should have put in place to avoid this breach. (4 marks)

* Change administrator password regularly
* Force users to change passwords frequently
* Discourage the sharing of passwords
* Remove inactive user accounts
* Remove nonemployees user accounts
* Perform random monitoring of all activities
* Perform database auditing
* Educate the end user

1. With examples explain the following terms used in database system

(6marks**)**

1. **Entities:**

An object in the mini world about which information is to be stored. Examples: persons, books, courses. Note: entities do not have to correspond to objects of physical existence. Entities may also represent conceptual objects like, e.g., vacations.

1. The **attribute values** that describe each entity become a major part of the data stored in the database. For example Employee entity may describe by Name, Age, address, salary and job
2. **Derived Attribute:** an attribute value can be determined from another attribute / related entity

Example age can be derived from date of birth and current date

1. Distinguish file based approach and database approach as used in data management

(2marks)

File-based approach: An approach that utilizes a collection of application programs which performs services to end-users (e.g. Reports). Each program defines and manages its own data.

Database approach: An approach that data is collected and manipulated using specific software called Database Management System, and many programs share this data.

1. State and describe the five components of the database management system environment.

(8 marks)

1. Hardware – The computer systems that the DBMS and the application programs run on. This can range from a single PC, thro a single mainframe to a network of computers
2. Software- The DBMS software and application programs, together with the operating system, including network software if the database is being used over a network
3. Data - The data acts as a bridge between the hardware and software components and the human components. The database contains both the operations data and the meta data (the data about data)
4. Procedures- The instructions and rules that govern the design and use of the database. This may include instructions on how to log on to the DBMS, make backup copies of the database and how to handle hardware or software failures.
5. Peaople - This include the database designers, database administrators (DBA), applications programmers and end users.

**(Any 4x 2 Marks Each)**

**Question four (20 marks)**

1. Describe three disadvantages of using database management system (6 Marks)

* **Complexity** – DBMS is extremely complex piece of software and all user ( Database designers and development, DBA and end users) must understand this functionality to take full advantages of it.
* **Cost –** The cost of DBMS varies significantly depending on environment and functionality provided. There is also recurrent annual maintenance cost, which is typically a percentage of the list price.
* **Higher impact of failure** The centralization of resources increases the vulnerability of the system. Since all users and application rely on the availability of the DBMS, the failure of any component can bring operation to a complete halt until the failure is repaired **(2 marks each)**

1. Discuss any three database objects found in Ms access (6 marks)

* Tables – this is where the actual data being stored is kept. A table is a collection of records that can be divided into fields. Each field holds a single piece of information about the record in which it resides
* Queries – a query is used to extract only certain information from a database. A query can select groups of records that fulfill certain conditions.
* Forms- used in a variety of ways but the most common use is for data entry and display . they can also be used to edit and search your data.
* Reports- enable you to output data to any number of destinations such as your printer or email message in an easy to read format.
* Data access pages – are web pages that you can create and link to an access database. These pages can query or update the data contained within the database
* Macros- are set of actions that each performs specific tasks with access. They help automate repetitive tasks without having to write.
* Modules – modules are collections of visual basic applications(VBA) procedures . VBA in access allows you to create your own custom functions and procedures.

1. Distinguish between decomposition and functional dependency (4 marks)

* Decomposition is a way of removing redundancy safely from databases while preserving the original data.
* Functional dependency is defined as a constraint between two sets of attributes in a relation from a database.

1. Describe set of properties that guarantee that database transactions are processed reliably. (4 marks)

(ACID)

**Atomicity** – refers to the ability of the database to guarantee that either all of the tasks of a transaction are performed or none of them are.

**Consistency**- the consistency property ensures that the database remains in a consistent state before the start of the transaction and after the transaction is over

**Isolation** – refers to the requirement that other operations cannot access or see the data in an intermediate state during a transaction

**Durability**- refers to the guarantee that once the user has been notified of success, the transaction will persist and not be undone.