Murang'a University College

(A Constituent College of Jomo Kenyatta University of Technology)

School of Business & Economics

End of Trimester examinations

Bachelor of Business and Information Technology

Unit Name: Database Systems

Unit Code: ICS 2206

1st Semester Year 2

DATE: **Time: 2 Hours**

Instructions

Answer Question ONE and any other TWO Questions

Question One

a) Briefly explain the following terms as used in database systems. Use an example in each case. (8 marks)

i.) Entity

ii.) Weak Entity set

iii.) Attribute

iv.) Data model

b) Define the term Data Independence and distinguish between physical data independence and logical data independence. (6 marks)

c) What do you understand by the term Database Architecture? (4 marks)

d) Explain the following terms

i.) Candidate Key

ii.) Foreign Key

iii.) Surrogate Key

iv.) Null value (4 marks)

e) Explain the various facilities/uses provided by a database management systems (DBMS). (8 marks)

Question Two

Consider the following information about a university database:

- Professors have an SSN, a name, an age, a rank, and a research specialty.
- Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
- Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
- Each project is managed by one professor (known as the project's principal investigator).
- Each project is worked on by one or more professors (known as the project's co-investigators).
- Professors can manage and/or work on multiple projects.
- Each project is worked on by one or more graduate students (known as the project's research assistants).
- When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
- Departments have a department number, a department name, and a main office.
- Departments have a professor (known as the chairman) who runs the department.
- Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
- Graduate students have one major department in which they are working on their degree.
- Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

Design and draw an ER diagram that captures the information about the university. Use only the basic ER model here; that is, entities, relationships, and attributes. Be sure to indicate any key and participation constraints. (12 marks)

b) Explain any **four** responsibilities of a Database Administrator (DBA)? (8 marks)

Question Three

a) Consider the following tables: Children, Playgroups, Activities. The Children tables contains data about children (names, ages and addresses of parents) - we assume for simplicity that names are unique, Playgroups says which child is in which playgroup

b) and Activities says what children in the playgroup did on a certain date (for example, went to a zoo). (14 marks)

Children		
Name	Age	Address

Playgroups	
PlaygroupID	Name

Activities		
PlaygroupID	ADate	Description

Write SQL queries to do the following:

i.) Find a list of names of all children. (2 marks)

ii.) Find a list of names of all children aged 4. (3 marks)

iii.) Return a list of names and addresses of all children in the playgroup with PlaygroupID equal to 1. (4 marks)

iv.) Find names and addresses of all children who are in the same playgroup as a child called `Amy Jones'. (4 marks)

c) Define **two** types of integrity constraints in the context of the relational model. Illustrate each integrity constraint with an example. Discuss why it is desirable to enforce integrity constraints. Use examples to illustrate your points. (8 marks)

Question Four

a) What to you understand by the term normalization? Define functional dependency of 1NF, 2 NF, 3 NF as used in normalization. (10 marks)

b) Explain various advantages of Database Management Systems (DBMSs) over

c) to file based systems. (10 marks)

Question Five

a) Define the term transaction and explain ACID properties of transaction with suitable examples. (11 marks)

b) Describe any **Three** of the the following Database Architectures. (9 marks)

i.) Mainframe Database Architecture

ii.) Stand-Alone Database Architecture

iii.) Two-Tier Database Architecture

iv.) Three-Tier Database Architecture