



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER

SCHOOL OF SCIENCE

BACHELOR OF SCIENCE

**(INFORMATION SCIENCES, COMPUTER
SCIENCES**

APPLIED STATISTICS WITH COMPUTING)

COURSE CODE: COM 2112-1

**COURSE TITLE: DATABASE MANAGEMENT
SYSTEMS**

DATE: 8TH APRIL, 2022

TIME: 1430-1630

INSTRUCTIONS TO CANDIDATES

(i) Answer Question **ONE** and any other **TWO** questions

This paper consists of 5 printed pages. Please turn over.

SECTION A (20Marks): Answer all questions from this section

QUESTION 1

- (a) Define what you understand by the following terms **(2 marks)**
(i) Foreign Key
(ii) Overlap constraint
(iii) Non-attribute key
(iv) Weak entity set
- (b) List four goals of entity relationship modeling **(2 Marks)**
- (c) Differentiate between the following **(2 Marks)**
(i) Relationship and relationship set
(ii) candidate key and the primary key
- (d) State and explain the components of a relationship in a relational database systems **(3 Marks)**
- (e) Give four advantages of using a DBMS **(4 Marks)**
- (f) Consider the following schema: **(5 Marks)**

Suppliers(sid: integer, sname: string, address: string)

Parts(pid: integer, pname: string, color: string)

Catalog(sid: integer, pid: integer, cost: real)

The Catalog relation lists the prices charged for parts by Suppliers.

Write the following queries in SQL:

- (i) Find the pnames of parts for which there is some supplier.
(ii) Find the snames of suppliers who supply every part.
(iii) Find the snames of suppliers who supply every red part.
(iv) Find the pnames of parts supplied by Acme Widget Suppliers and no one else.
(v) Find the sids of suppliers who charge more for some part than the average cost of that part (averaged over all the suppliers who supply that part).
- (g) Explain the purpose and scope of database security **(2 Marks)**

SECTION B (30Marks): Answer TWO questions from this section

QUESTION 2

- (a) State and explain any two approaches to data modeling **(2 Marks)**
- (b) Name the relationships between EMPLOYEE and JOB in the following business scenario and include the appropriate optionality and cardinality.

“We have a lot of employees who handle one or more different jobs. We’d like to keep track of who is working on which job. Although

employees can help each other, a job is assigned to one employee and is the ultimate responsibility of that employee. All of our employees have at least one job. However, jobs exist that are not yet assigned to anyone.”

(2 Marks)

(c) Give four types of SQL commands

(2 Marks)

(d) I manage the Human Resources Department for a large company. We need to store data about each of our company’s employees. We need to track each employee’s first name, last name, job or position, hire date and salary. For each employee on commission, we also need to track his/her potential commission. Each employee is assigned a unique employee number. Our company is divided into departments. Each employee reports to a department for example accounting, sales or development. We need to know the department responsible for each employee and the department location. Each department has a unique number. Some employees are managers. We need to know each employee’s manager and all of the employees that are managed by each manager.

(6 Marks)

(i) Draw the relationship matrix

(ii) Design a conceptual schema for the Human Resource Department and

(iii) Draw an ER diagram for your schema

(e) Explain the important role played by users in the process of database design.

(3 Marks)

QUESTION 3

(a) From the following list identify which items are supertype entity and which items are subtypes of that entity.

(2 Marks)

(i) Amputation

(ii) Visual Impairment

(iii) Disability

(iv) Paralysis

- (b) Create an ERD based on the following Summit Sporting Goods scenario. Be sure to follow drawing conventions for readability and clarity. **(6 Marks)**

“I’m a manager of a sporting-goods wholesale company that operates worldwide to fill orders from retail sporting-goods stores. The stores are our customers (some of our people prefer to call them our clients). Right now we have 15 customers worldwide, but we’re trying to expand our customer base by about 10% each year starting this year. Our two biggest customers are Big John’s Sports Emporium in San Francisco and Womansports in Seattle. For each customer, we must track an ID and a name.

We may track an address (including the city, state, zip code, and country) and phone number. We maintain warehouses in different regions to best fill the order of our customers. For each order, we must track an ID. We may track the date ordered, date shipped, and payment type when the information is available.”

- (c) A university database contains information about professors (identified by social security number, or SSN) and courses (identified by courseid). Professors teach courses; each of the following situations concerns the Teaches relationship set.

For each situation, draw an ER diagram that describes it (assuming no further constraints hold). **(3 Marks)**

1. Professors can teach the same course in several semesters, and each offering must be recorded.
 2. Professors can teach the same course in several semesters, and only the most recent such offering needs to be recorded. (Assume this condition applies in all subsequent questions.)
 3. Every professor must teach some course.
- (d) Discuss the main types of threat that could affect a database system, and for each, describe the possible outcomes for an organization. **(4 Marks)**

QUESTION 4

- (a) Define the following **(3 Marks)**
- (i) The relation cardinality
 - (ii) The relation degree
 - (iii) Weak entity set
- (b) What is an unsafe query and explain why it is important to disallow such queries **(2 Marks)**
- (c) Consider the following business scenario **(4 Marks)**

“We assign our waiters to certain areas, except for our trainees who just observe and are not responsible for taking any orders yet. A waiter takes the orders for the tables in his area. All areas have one assigned waiter. A customer places an order with a waiter. If the customer has a question or wants to make a change to the order, he needs to request this with the assigned waiter.”

Give the relationships between ORDER and WAITER and include the appropriate optionality and cardinality.

(d) Consider the SQL query whose answer is show below

(6 Marks)

<i>sid</i>	<i>name</i>	<i>login</i>	<i>age</i>	<i>gpa</i>
53831	Madayan	madayan@music	11	1.8
53832	Guldu	guldu@music	12	2.0

Table showing Students with age < 18 on Instance S

- (i) Modify this query so that only the login column is included in the answer
- (ii) If the clause WHERE S.gpa >= 2 is added to the original query, what is the set of tuples in the answer

/////END/////