

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATIONS**

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF  
SCIENCE IN COMPUTER SCIENCE**

**COSC 250: INTRODUCTION TO DATABASE SYSTEMS**

**STREAMS: BSC. COMPUTER SCIENCE**

**TIME: 2 HOURS**

**DAY/DATE: WEDNESDAY 07/07/2021**

**11.30 A.M. – 1.30 P.M.**

**INSTRUCTIONS:**

**Attempt questions 1 section A and any other 2 questions in section B Question One**

**SECTION A (30 MARKS) – COMPULSORY**

**QUESTION ONE: 30 MARKS**

- a) i) Outline four typical components of database systems. **(2 marks)**
- ii) Differentiate between DDL and DML as used in SQL. **(2 marks)**
- b) Define the following terms as used in databases: **(8 marks)**
  - i) Domain.
  - ii) Entity set.
  - iii) Relationship set.
  - iv) One-to-many relationship.
- c) (i) Using relevant example describe a schema as used in databases. **(4 marks)**
- (ii) John intends to carry out the conceptual database design in their organization. Explain two types of relationships among the entities he is likely to model. **(4 marks)**
- d) Explain the term transitive dependence as used in database design. **(2 marks)**
- e) Explain the function of following DBMS components:
  - I. transaction manager;

**II. Scheduler. (4 marks)**

f) With the aid of an example, explain the following terms as used in databases:

(i) Inner joins

(ii) Outer joins **(4 marks)**

**SECTION B (40 MARKS) ATTEMPT ANY TWO QUESTIONS****QUESTION TWO: 20 MARKS**

a) During the development of a database, it is important to address security issues adequately. Explain two characteristics of database security that should be used as parameters. **(4 marks)**

b) With the aid of a diagram, outline the typical database architecture. **(6 marks)**

c)

i) The company is organized into departments. Each department has a unique name, a unique number, and a particular employee who manages the department. We keep track of the start date when that employee began managing the department. A department may have several locations.

ii) A department controls a number of projects, each of which has a unique name, a unique number, and a single location.

iii) We store each employee's name, Social Security number, 2 address, salary, sex (gender), and birth date. An employee is assigned to one department, but may work on several projects, which are not necessarily controlled by the same department. We keep track of the current number of hours per week that an employee works on each project. We also keep track of the direct supervisor of each employee (who is another employee).

iv) We want to keep track of the dependents of each employee for insurance purposes. We keep each dependent's first name, sex, birth date, and relationship to the employee.

Represent this information using an ERD. Show the cardinalities. **(10 marks)**

**QUESTION THREE: 20 MARKS**

a) Write the result of the following SQL operation and the tables given below :

**(2 marks)**

Select S.name, E.cid  
 From Students S.sid, Enrolled E  
 WHERE S.sid=E.sid AND E. grade= 'B'

sid	cid	grade
53831	Carnatic101	C
53831	Reggae203	B
53650	Topology112	A
53666	History105	B

sid	name	login	age	gpa
53666	Jones	jones@cs	18	3.4
53688	Smith	smith@ee	18	3.2

b) Bob would like to model the entity relationships in a procurement system. Outline the steps he could use to achieve his objective. **(8 marks)**

c) A table called tbl Employee has the following fields: –

Employee ID, First Name, Second Name, Date of Birth, Gender, Marital Status, Religion and Salary.

Write SQL statements to do each of the following;

- i. Retrieve all records [include all fields] from the table. **(2 marks)**
- ii. Retrieve the Employee ID, First Name, Second Name, Date of Birth, Gender and Marital Status. First Name and Second Name should be combined and assigned the caption Employee Name. **(3 marks)**
- iii. Retrieve Employee ID, First Name, Second Name, Salary, Allowance and Gross from the table. NB: The allowance is 35% of the Salary and the Gross is the sum of salary and Allowance. **(4 marks)**
- iv. Give the full name for the Acronym SQL. **(1 mark)**

**QUESTION FOUR: 20 MARKS**

a) Many firms are installing databases systems. Explain two challenges that these firms are likely experiencing in this endeavor. **(4 marks)**

b) Transactions Management deals with the problem of always keeping the database in a consistent state even when concurrent accesses and failures occur.

i) Define a transaction. **(2 marks)**

ii) With respect to database transaction management explain the following terms;

- I. Atomicity.
- II. Consistency.
- III. Isolation.
- IV. Durability. **(8 marks)**

d) Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course.

- STUDENT (Ssn, Name, Major, Bdate)
- COURSE (Course#, Cname, Dept)
- ENROLL (Ssn, Course#, Quarter, Grade)
- BOOK\_ADOPTION (Course#, Quarter, Book\_isbn)
- TEXT (Book\_isbn, Book\_title, Publisher, Author)

Specify the foreign keys for this schema, stating any assumptions you make. **(6 marks)**

**QUESTION FIVE: 20 MARKS**

a) List and explain three types of update anomalies that might result in tables that have redundant data. **(6 marks)**

b) Chuka University intends to install a database system in order to improve its image as per the ISO requirements. Outline four benefits that would be realized from this decision. **(2 marks)**

c) Define Normalization. Explain 1 NF, 2NF, 3NF, BCNF using appropriate examples. **(12 marks)**

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