SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Information Technology

Second Year, First Semester Examination – 2023

HNDIT3042- Database Management Systems

Instructions for Candidates:
Answer any five (5) Questions
All questions carry equal marks.

No. of questions: 06
No. of pages 04
Time : 03 hours

Question 1

I. Explain the term Database. (04 marks)

II. Discuss how a Database Management System (DBMS) overcomes the limitations of the Traditional File-based System. (04 marks)

III. Describe the schemas in the Three-Schema Architecture. (06 marks)

IV. Briefly explain two types of database uses. (06 marks)

(20 Marks)

Question 2

I. What is Database Models (04 marks)

II. State a difference between Hierarchical and Network Data Models. (04 marks)

III. A database has a table Student with the following attributes:

- StudentID (Integer)
- Name (String)
- Age (Integer between 18 and 25)
- Email (String matching email format)

Explain how domains can be applied to ensure that data entered into the student table is valid. (06 marks)

IV. Define and explain the following types of keys in the context of relational databases: (6 marks)

a. Alternate Key
b. Composite Key
c. Candidate Key

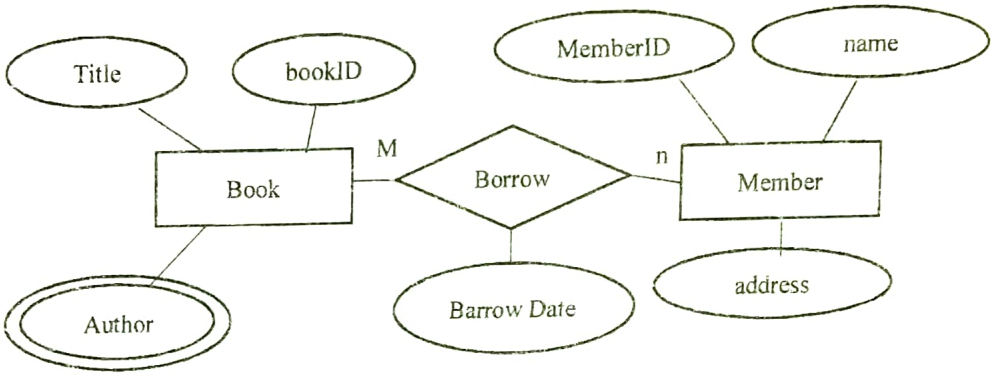
(20 Marks)

Question 3

I. Explain what is cardinality ratio available in ERD. (04 marks)

II. Draw an entity relationship diagram based on the following scenario.
Design a database for a university to manage its academic activities, focusing on students, courses, and instructors. Each student must have a unique Student ID, name, age, and email. Similarly, each instructor is identified by a unique Instructor ID and has attributes such as name, department, and email. Courses in the university are uniquely identified by a Course ID and include attributes such as course name and credits. A student can enroll in multiple courses, and each course can have multiple students. Additionally, each course is taught by one instructor, while an instructor can teach multiple courses. (06 marks)

III. Convert the following ER diagram into relational tables. Ensure you include primary and foreign key constraints.



(06 marks)

IV. Briefly explain the concept of Specialization/ Generalization in EERD. (04 marks)

Question 4

(i).Name two anomalies in Unnormalized table. (04 marks)

(ii).Name types of functional dependencies which removed when it convert to:

a. 2NF
b. 3NF (04 marks)

(iii).Use the following database table to answer the questions given below.

BorrowerID	BookID	BorrowerName	BookTitle	BorrowerDate
B1	BO1	KAMAL	C#	5-5-2024
B1	BO3	KAMAL	PHP	20-6-2024
B2	BO1	ALI	C#	8-8-2024

a) What is the Normalization form in above table? justify your answer. (4 marks)
b) Convert the above table into 3NF. (8 marks)

(20 Marks)

Question 5

I. **Borrowers** and **BorrowedBooks** tables are given in Table 4.1 and Table 4.2. respectively. Primary keys are underlined.

Table 5.1 : Borrowers Table

BorrowerID	Name	Email
101	Alice Johnson	alice@example.com
102	Bob Smith	bob@example.com
103	Charlie Brown	charlie@example.com

Table 5.2 : BorrowedBooks Table

BorrowerID	BookID	BorrowDate	ReturnDate
101	B001	2024-11-01	2024-11-10
101	B002	2024-11-03	2024-11-12
102	B003	2024-11-05	2024-11-15
103	B004	2024-11-07	2024-11-17

a) Write the SQL statements to create the Table 4.1. Select suitable data types for each column. (4 marks)

b) Write the SQL statements to create the Table 4.2. Define a foreign key constraint on the BorrowedBooks table, linking the BorrowerID column to the Borrowers table.. (4 marks)

c) Write the SQL statments to insert a single record in the two(2) tables created in (a). (4 marks)

d) Write an SQL query to change the email of "Alice Johnson" to alice.johnson@example.com. (4 marks)

e) Write an SQL query to delete the record of the borrower with BorrowerID = 103 from the Borrowers table. (4 marks)

(20 Marks)

Question 6

I. Use Students and Courses tables to answer the questions given below.

Table 6.1 :Students

StudentID	Name	Age	Email	CourseID
201	Alice Brown	20	alice.brown@example.com	C101
202	Bob Green	22	bob.green@example.com	C102
203	Charlie Adams	21	charlie.adams@example.com	C101
204	Diana Miller	23	diana.miller@example.com	C103

Table 6.2: Courses

CourseID	CourseName	Credits	Instructor
C101	Math	3	Dr. Johnson
C102	Physics	4	Dr. Green
C103	Chemistry	3	Dr. Adams

a) Write a query to fetch all records from the Students table. (2 marks)

b) Write a query to list the names and ages of students who are enrolled in the course with CourseID = 'C101'. (2 marks)

c) Write a query to display the Name, CourseName, and Instructor of all students by joining the Students and Courses tables. (4 marks)

d) Write a query to retrieve the names of students taught by Dr. Johnson. (4 marks)

e) Write a query to list the names and emails of students who are older than 21. (2 marks)

II. Explain the key differences between Discretionary Access Control (DAC) and Mandatory Access Control (MAC). (3 marks)

What are the key components of an effective backup (3 marks)

(20 Marks)