

Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
100 level 2nd Semester Examination – Dec. / Jan. 2017
CST122-3 Database Management Systems - I



Instructions to candidates

Duration: Two (02) hours

Number of questions: Four (04)

Mark allocation: 100

Answer all questions.

1.

- a. List three (03) advantages in Database Management Systems (DBMS) approach over traditional file-based approach and give two (02) examples for DBMSs. (5 mark)
- b. What is **data independence** in three schema architecture? Briefly explain the two (02) types of data independence in the database approach. (6 mark)
- c. Briefly explain the importance of DCL statements in SQL and state two (02) DCL statements with their descriptions. (4 mark)
- d. Explain the usage of a primary key in relational databases. Why a composite key has to be defined for some relations? (6 mark)
- e. Consider the relational schemas given below.

Employee (EmpID, EmpName, ContactNo, JoinedDate, BasicSalary_Rs, DeptNo, PrjNo)

Department (DeptNo, DeptName, ManagerNo)

Project (PrjNo, Description, Location)

Write the relational algebra expressions for the following statements.

- i. Display all the department numbers with their names. (2 mark)
- ii. Select the employees who have joined before 1st of January 2015. (2 mark)
- iii. Display all the projects located at Badulla city. (2 mark)
- iv. Display the employee IDs and names who are earning more than Rs.25000 and the employees who are earning less than Rs.10000 as their basic salary. (3 mark)



2.

a. Entity Relationship (ER) diagrams and Enhanced-Entity Relationship (EER) diagrams are the graphical representations of the logical structure of a database.

i. Briefly explain the term **partial participation** in ER diagrams using an example. (4 mark)

ii. What is **disjoint** in EER diagrams? Give an example. (2 mark)

iii. Draw an Entity Relationship (ER) diagram for the following scenario. Clearly indicate all the cardinality ratios, participation constraints in the diagram. Write all the assumptions you have made when designing the diagram.

A general hospital consists of number of wards. Each ward has a unique ward number, name and the number of beds in that ward. A doctor is assigned to a single ward, but a ward can have many doctors. A ward hosts a number of residential patients. For each patient, an admission number (unique) is maintained by the hospital and the full name, age, address and the date of admission of the patient are stored in the database. When a patient is admitted to the hospital the details of a guardian such as the guardian name, address and contact number have to be recorded. Each patient has to take treatments and the treatments are prescribed by a doctor. Each treatment has a unique treatment number and description. It also keeps a track of the treatment dosage for each patient. One patient may be prescribed more than one treatment and the same treatment can be prescribed for many patients. The hospital records a unique ID number, the doctor's name, address, telephone number and specialization of each doctor. A patient is assigned to one doctor, but a doctor can treat many patients.

(12 mark)

b. 'Database schema' can be known as a description about the database and it is specified during the database design.

i. Suppose there is a **1:m relationship with a simple attribute of the relationship type** in an ER diagram. What is the procedure to be followed when designing the schema for that situation? (2 mark)

ii. Derive the relational schema corresponding to the ER diagram of a university scenario given in the Figure 1 (Page 3). (10 mark)

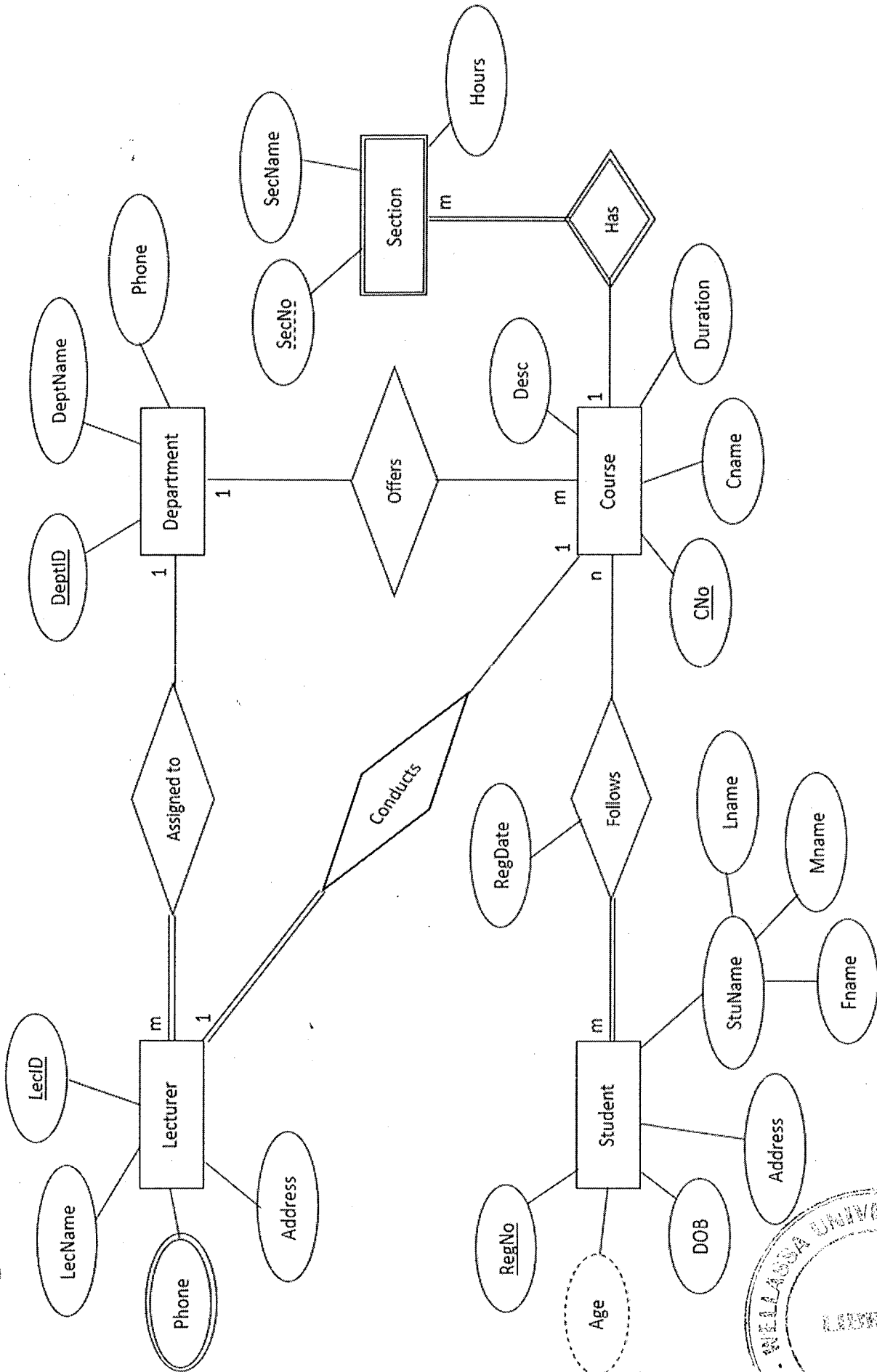
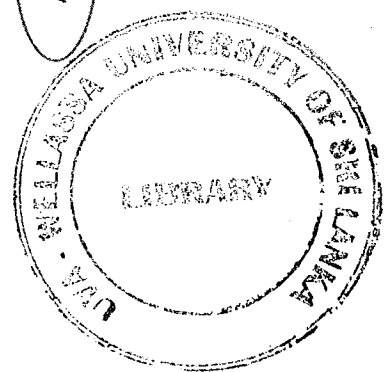


Figure 1: ER diagram for a university scenario



3.

a. What are insertion anomalies? Explain with a suitable example.

(5 mark)

b. Assume that the following relation is in 1NF.

Customer = {CustomerNo, ItemNo, CustomerName, City, Street, ItemName, Qty}

i. When we decompose a 1NF relation into 2NF, we have to remove all the partial functional dependencies exist in the relation. Explain the term partial functional dependency using the above relation.

(5 mark)

ii. Decompose the Customer relation into 2NF and 3NF relations separately considering the following dependencies.

D1 = {CustomerNo, ItemNo} -> {Qty}

D2 = {CustomerNo} -> {CustomerName, City}

D3 = {ItemNo} -> {ItemName}

D4 = {City} -> {Street}

(10 mark)

4.

a. Assume that you have created the following Customer table without constraints.

Customer (CustomerID, CustomerName, ContactNo, RegisteredDate)

- Write the SQL statement to make CustomerID as the primary key of the table.
- The contact number should be a unique field in the customer table. What is the corresponding SQL statement to make that field unique?

(6 mark)

b. Assume that a library is having a database called **LibraryDB** to maintain the book details and borrowing details. Consider the following tables and write SQL statements to perform the tasks given in the questions from i to v.

Book (BookID, Title, ISBN, Category, Price_Rs, PubID)

Publisher (PubID, PubName, Location, ContactNo)

Borrower (BorrowerID, BorrowerName, Gender, Age, Phone, RegisteredDate)

BookBorrow (BorrowerID, BookID, Date)

i. Display the Title and the ISBN of the books in 'Sinhala Novels' category.

(2 mark)

ii. Display the publishers who have published books with the price less than Rs.1000.

(3 mark)

iii. How many books are there in the library with the title starting from letter 'S'?

(3 mark)

iv. Find the title of the book with the highest price using SQL functions. Alias the column as 'Highest Price Book'.

(3 mark)

v. Display the details of the 'Female' borrowers who have borrowed books those published by 'Godage' publishers or 'Suriya' publishers.

(3 mark)