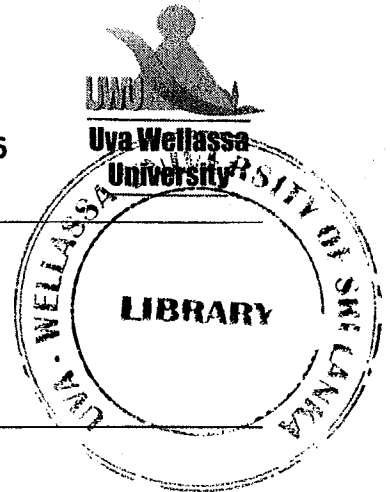


(2)

Uva Wellassa University of Sri Lanka  
Faculty of Science and Technology  
Department of Computer Science and Technology  
100 level 2<sup>nd</sup> Semester Examination – Jan. / Feb. 2016  
CST 104-3 Database Management Systems



**Instructions to candidates**

**Duration:** 03 hours

**Number of questions:** Six (06)

**Answer all questions**

**Mark allocation:** 100

- 1.
- a. List three (03) advantages and two (02) disadvantages in DBMS approach over traditional file-based approach. (5 mark)
  - b. Name the levels in **Three Schema Architecture** used in the database approach. (3 mark)
  - c. **Key constraint** and the **Referential integrity constraint** are two types of constraints in relational model. Explain those with examples. (6 mark)
  - d. Briefly explain the following terms with two (02) examples for each. (6 mark)
    - i. DDL
    - ii. DML
    - iii. DCL
- 2.
- a. Briefly explain two (02) benefits of database views. (2 mark)
  - b. Consider the schemas given below.  
**Customer** (CustomerID, CustomerName, ContactNo, RegisteredDate)  
**Product** (ProductID, ProductName, MeasurementUnit, UnitPrice\_LKR)  
**SalesOrder** (OrderNo, CustomerID, ProductID, OrderDate, QtyOrdered)  
Write the relational algebra expressions for the following statements.
    - i. Display all the products which are measured in kilograms.
    - ii. Display the customer id, customer name and the contact number of all the customers.
    - iii. Display the product ids and product names of all the products which has a unit price more than 100 LKR.
    - iv. Display the product id, customer id and ordered quantity of all the products which have ordered on 10-01-2016. (8 mark)

3.

- a. Define composite and derived attributes with an example for each. (4 mark)
- b. Briefly explain **one-to-many (1:m) cardinality ratio** and **partial participation** using examples. (4 mark)
- c. What is **generalization** and **specialization** in Enhanced-Entity Relationship (EER) Diagrams? (2 mark)
- d. 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 university consists of several departments. A department has a unique department code, name and a phone number. A department conducts several courses. Some courses have prerequisite courses which are common to many courses. A course has a course number, name, number of hours and a description. Lecturers are assigned to various departments. In one department there can be many lecturers. But one lecturer is assigned to one department only. A lecturer has an ID, name, address and telephone number (a lecturer can have multiple telephone numbers) as attributes. A lecturer teaches many students. The students are assigned to departments. A student has a unique student number, name, address, date of birth and age. For each student, the assigned date to the department has to be recorded. Under a course there are many sections. A section has a section number, number of days, time and class room number. A lecturer teaches many sections.

(10 mark)

4.

- a. What is a **schema** of a database system? (2 mark)
- b. Suppose you have come up with a **m:n 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? (3 mark)
- c. Derive the relational schema corresponding to the ER diagram of a company scenario given in the Figure 1 (Page 3). (10 mark)

5.

a. What is meant by normalization?

(2 mark)

b. The following relation is given in ONF.

| Purchase Order No | Purchase Order Date | Employee Code | Supplier No | Supplier Name   | Part No | Description | Part Quantity (kg) |
|-------------------|---------------------|---------------|-------------|-----------------|---------|-------------|--------------------|
| 100011            | 01-01-15            | E002          | S2          | ABC Enterprises | P1      | Sugar       | 100                |
|                   |                     |               |             |                 | P2      | Samba Rice  | 50                 |
|                   |                     |               |             |                 | P3      | B Onion     | 10                 |
|                   |                     |               |             |                 | P5      | Red Kekulu  | 30                 |
| 100012            | 15-01-15            | E003          | S4          | XYZ Co. Ltd.    | P2      | Samba Rice  | 100                |
|                   |                     |               |             |                 | P5      | Red Kekulu  | 20                 |
| 100013            | 01-02-15            | E001          | S1          | BCD Ltd.        | P1      | Sugar       | 80                 |
|                   |                     |               |             |                 | P3      | B Onion     | 20                 |
| 100014            | 15-02-15            | E005          | S5          | BDC Services    | P6      | Potato      | 10                 |
| 100015            | 02-03-15            | E004          | S2          | ABC Enterprises | P7      | Nadu Rice   | 20                 |
| 100016            | 15-03-15            | E004          | S3          | PGR Corporation | P8      | Red Onion   | 10                 |

i. What are the three (03) types of anomalies that can be occurred in databases due to data redundancy? Explain those briefly using the above ONF relation.

(6 mark)

ii. Normalize the above relation into 1NF, 2NF and 3NF. Clearly identify all the primary keys of the relations in each step.

(7 mark)

6.

a. Write the SQL statement to create the following **Customer** table.

| Field Name     | Type | Size | Constraints |
|----------------|------|------|-------------|
| CustomerID     | Text | 4    | Primary Key |
| CustomerName   | Text | 20   | Not Null    |
| ContactNo      | Text | 10   | Unique      |
| RegisteredDate | Date |      |             |

(4 mark)

b. Assume that an organization is having a database called **Organization** to maintain their officers' data. Consider the following four (04) tables of the Organization database and write the SQL statements to perform the tasks given in the questions from i to viii.

**Officer** (OffNo, OffName, Sex, NIC, DOB, Address, Phone, DesigCode, DeptCode)

**Department** (DeptCode, DeptName, DeptHeadNo, Location, Address, Phone, Fax)

**Designation** (DesigCode, Designation, SalaryCode)

**Salary** (SalaryCode, SalaryScale, BasicSalary, Increment)

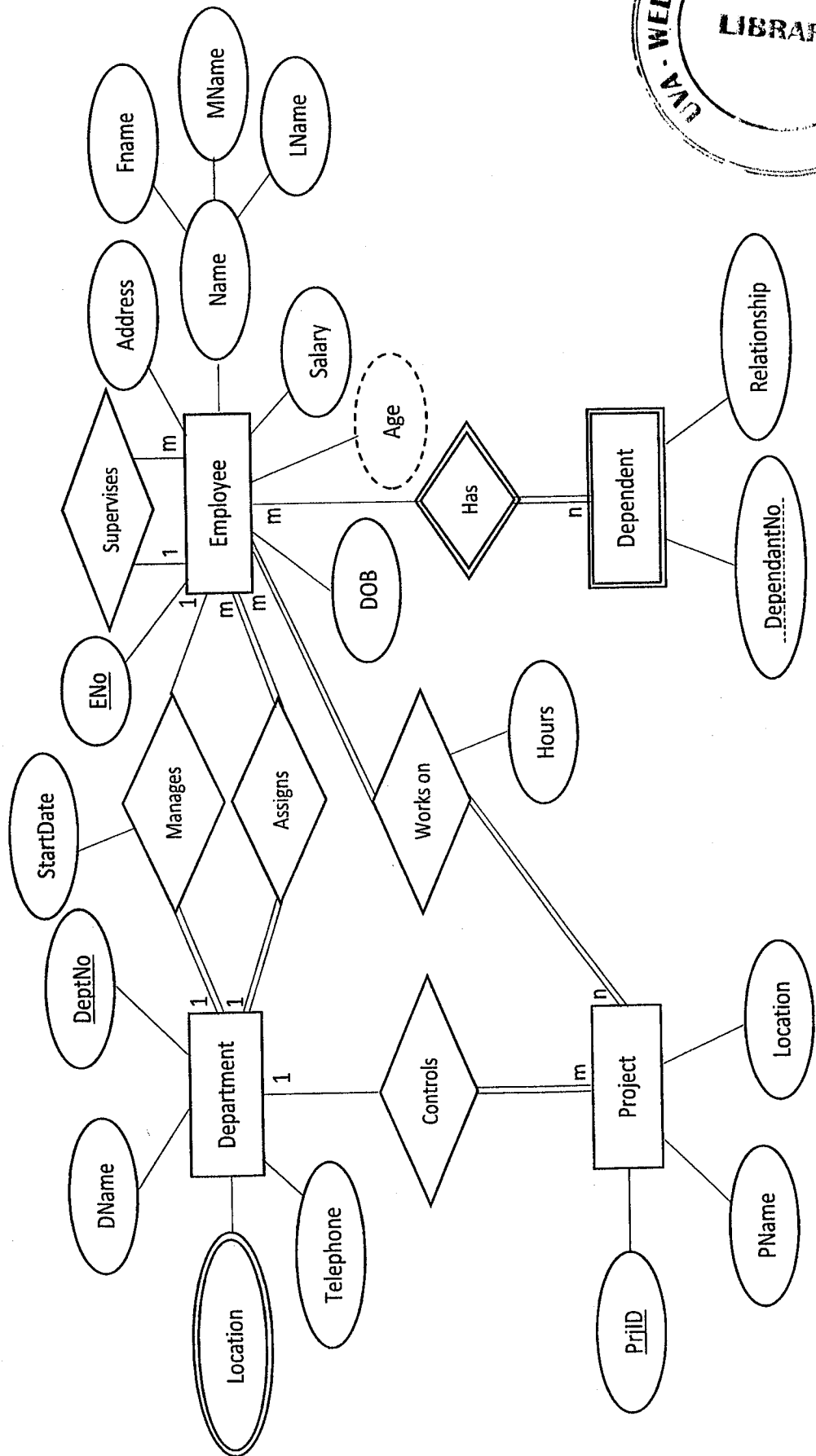


Figure 1: ER Diagram for a Company Scenario

- i. Display the **officer number** and the name of all **Female** officers in the organization.
- ii. Find all the employees of the **Research** department who were born before **1980**.
- iii. Display details of all officers who are using a Dialog mobile number. (Hint: Dialog mobile numbers start with 077 and 076)
- iv. Find the total basic salary of all the officers in the organization and display the column name as **Sum of Basic Salary**.
- v. Find the basic salary of the officer **Nimal Perera**.
- vi. Find the names of all **Programmers** of the **Computer** department.
- vii. Create a view consisting with **officer number**, **officer name**, **department name** and the **designation** of the officer.
- viii. Modify the basic salary of the **Manager** designation by adding 1000 to the current basic salary.

(16 mark)

