



**SLIATE**

**SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION**

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

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**Higher National Diploma in Information Technology**  
**Second Year, Second Semester Examination – 2019**  
**HNDIT1105-Database Management Systems-Marking Schema**

Instructions for Candidates:

Answer any four questions

Every question carry 25 marks

No. of questions : 5

No. of pages : 5

Time : 2 hours

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**Question 1**

I. Write four (4) reasons select DBMS to manage databases in an organization

*To store the data*

*To query the data*

*To provide different views on the same data*

*Minimal data redundancy*

*Efficient data access*

*Data integrity and security*

*Data administration*

*Concurrent access, recovery from crashes*

*Reduced application development time*

***Any correct 04 reasons give 01 mark for each.***

II. List 2 main characters of the database Approach and briefly explain one of them

*Self-describing nature of a database system*

*Insulation between programs and data*

*Data Abstraction*

*Support of multiple views of the data*

*Any correct two characteristics 02 marks*

*Self-describing nature of a database system*

*A DBMS **catalog** stores the description of the database.*

*– called **meta-data**).*

*– allows the DBMS software to work with different databases.*

*A simple diagram to show raw data and meta data*

*Insulation between programs and data*

*Allows changing data storage structures and operations without having to change the DBMS access programs.*

*Data Abstraction*

*A data model is used to hide storage details and present the users with a conceptual view of the database.*

*Support of multiple views of the data*

*Each user may see a different view of the database, which describes only the data of interest to that user.*

*Any characteristic 02 marks*

III. What are the responsibilities of the DBA and the database designers? (4 marks)

*DBA -The DBA is responsible for authorizing access to the database, coordinating and monitoring its use, and acquiring software and hardware resources as needed. The DBA is accountable for problems such as security breaches and poor system response time.*

*Any two responsibilities 02 marks*

*DB designers-*

- Database designers are responsible for identifying the data to be stored in the database and for choosing appropriate structures to represent and store this data.*
- It is the responsibility of database designers to communicate with all prospective database users in order to understand their requirements and to create a design that meets these requirements.*
- In many cases, the designers are on the staff of the DBA and may be assigned other staff responsibilities after the database design is completed.*
- Database designers typically interact with each potential group of users and develop views of the database that meet the data and processing requirements of these groups.*

IV. Explain the components of database System environment (5 marks)

*Hardware*

*Can range from a PC to a network of computers.*

*Software*

*DBMS, operating system, network software (if necessary) and also the application programs.*

*Data*

*Used by the organization and a description of this data called the schema.*

*Procedures*

*Instructions and rules that should be applied to the design and use of the database and DBMS.*

## People

*Data Administrator (DA), Database Administrator (DBA), Database Designers (Logical and Physical), Application Programmers, End Users (naive and sophisticated)*

### V. Explain the following terms.

#### a. Data & Information

*Data- stream of raw facts representing things or events that have happened*

*Information-Information is data that has been processed to make it meaningful and useful*

*Any correct definition gives **01 mark for each.***

#### b. Database

*A shared collection of logically related data designed to meet the information requirements of an organization. **02 marks***

#### c. DBMS

*A software system that enables users to define, create and maintain the database and which provides controlled access to the database **02 marks***

#### d. Concurrency control

*Concurrency control is the procedure in DBMS for managing simultaneous operations without conflicting with each another. **02 marks***

(8 marks)

## Question 2

[Total 25 marks]

### I. Briefly explain what is database architecture?

(04 marks)

*The database architecture is the set of specifications, rules, and processes that dictate how data is stored in a database and how data is accessed by components of a system.*

### II. What is **data model**? Give two examples for data implementation models.

*Data model: A set of concepts to describe the structure of a database and certain constraints that the database should obey* (02 marks)

- *Relational data model, network model, Hierarchical model, Object-oriented* (02 marks)

### III. What is the benefit of using input mask in Ms Access database?

(04 marks)

*It makes data entry easier and to control the values users can Enter in a text box control.*

### IV. Define logical data independence & physical independence. What is the need of **mapping** between schemas?

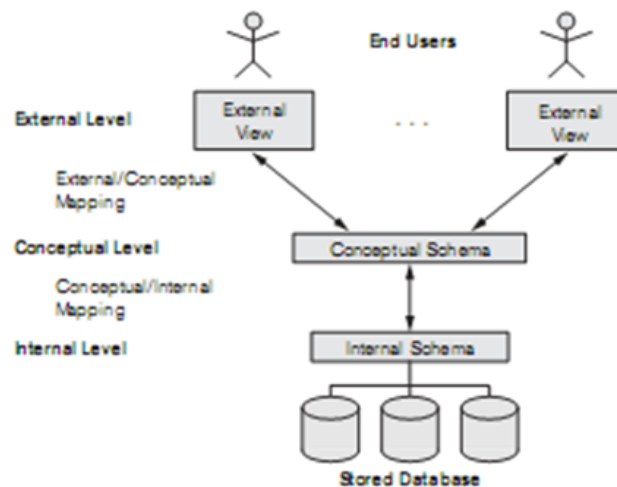
*Logical Data Independence: The capacity to change the conceptual schema without having to change the external schemas and their application programs. (02 marks)*

*Physical Data Independence: The capacity to change the internal schema without having to change the conceptual schema. (02 marks)*

*One mark for each*

**Mappings** among schema levels are needed to transform requests and data. Programs refer to an external schema, and are mapped by the DBMS to the internal schema for execution → data independence (01 marks)

V. Describe the three-schema architecture with a suitable diagram. (08 marks)



*06 marks for three levels , 02 marks for mapping*

### Question 3

[Total 25 marks]

- I. Following table explain the information about Student. Identify suitable data type for each column in MS Access. (1/2 x6=03 marks)

#### STUDENT

Stu_No	Name	Date of birth	Year	GPA	Web
S100	Kamal	03/10/1990	1	3.4	<a href="http://www.rjt.ac.lk">www.rjt.ac.lk</a>
S101	Sarath	10/12/1987	2	3.2	<a href="http://www.rjt.ac.lk">www.rjt.ac.lk</a>

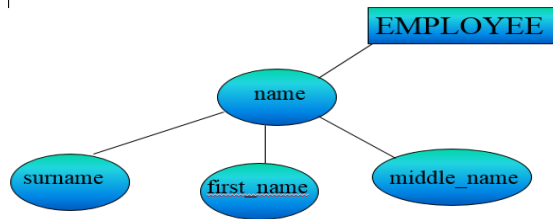
Stu\_no -

short Text, Name- short Text, BirthDay- Date/Time, Year- number, GPA-float, Web-Hyperlink

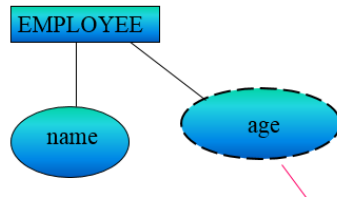
II. Define Following attribute types with the relevant ER diagram fragment.

a. Composite attribute

*Composite attributes can be divided into subparts.*

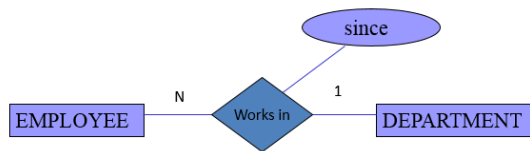


b. Derived attribute



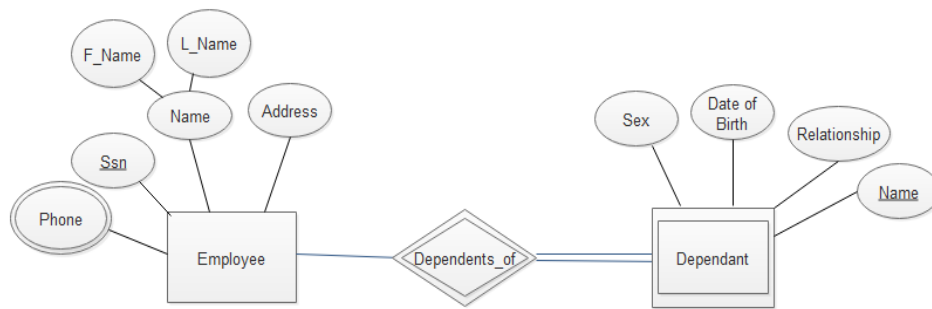
a. Descriptive attribute

*Sometimes, relationships can also have attributes called descriptive attributes that record information about the relationship.*



(02 x 3=06 marks)

III. Convert the following ERD fragment to corresponding relations. (02x3=06 marks)



Employee (F\_name,L\_name,Address.SSN)

Dependent(Name, Sex,Relationship,Dat o Birth,Ssn)

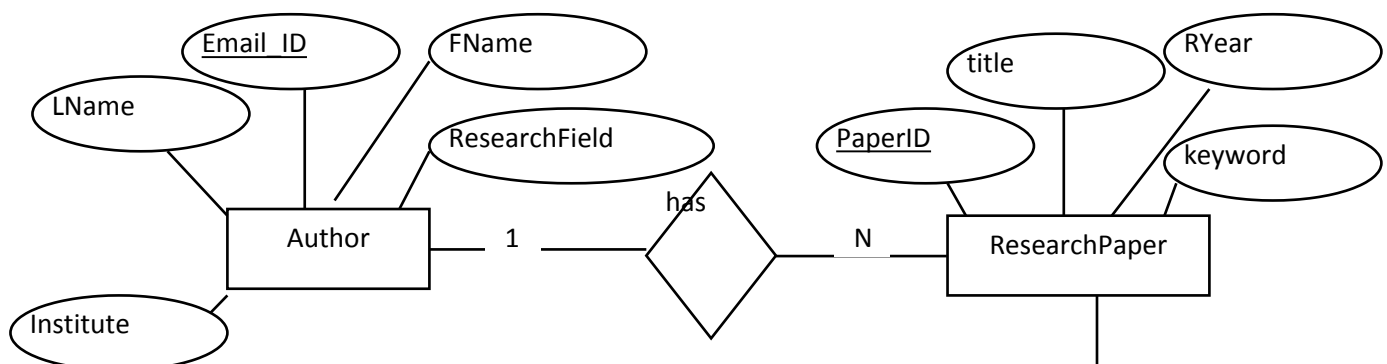
Employee\_phone(Ssn,Phone)

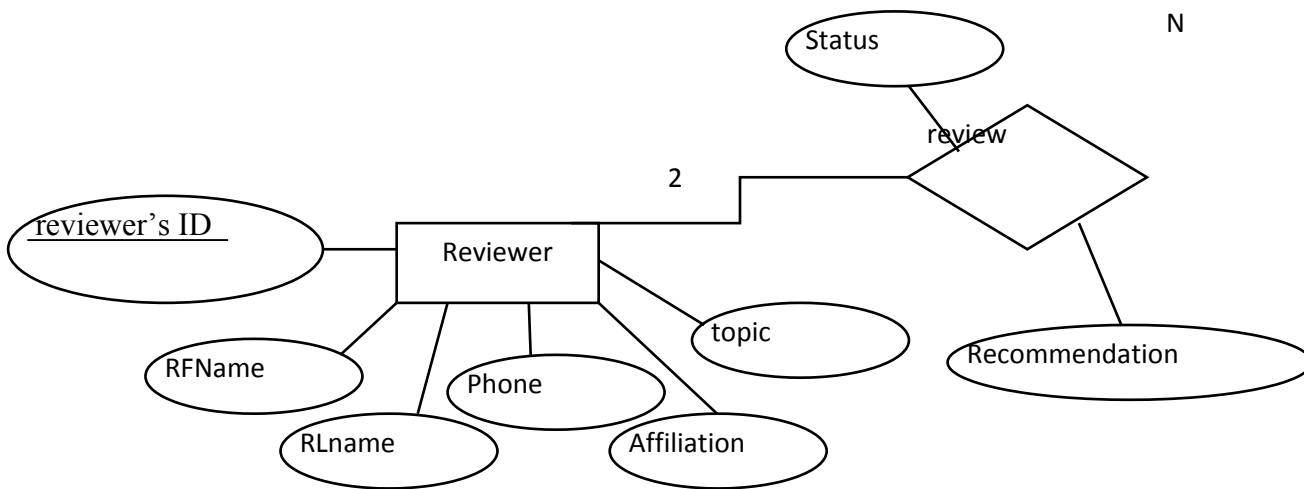
IV. The university research symposium committee has decided to use a database to handle the research papers of the annual research symposium. Reviewer's comments, author information also recorded.

The data requirements are summarized as follows.

- The authors of the papers are uniquely identified by an email\_ID. First name, last name, research field and institute are also recorded.
- A paper may have multiple authors, Each paper is assigned a paper ID by the system and is described by a title, keywords of the paper, and the year of the research.
- Each reviewer is uniquely identified by a reviewer's ID. Each reviewer's first name, last name, phone number, affiliation and topics of interest are also recorded.
- Each paper is reviewed by two reviewers. A reviewer marks each paper assigned to him. These marks are stored as a review status along with the paper id and the reviewer's id. Finally, each reviewer provides an overall recommendation regarding each paper.

- a. Identify all the **entities**, **attributes** and then draw the ER (Entity Relationship) diagram for the proposed system. (10 marks)





*Give 4 marks for correct identifications of entities and attributes*

*Give 4 marks for correct relationships*

*Give 2 mark for Descriptive attribute*

#### Question 04

I. Consider the following schema,

Employee (F\_name, L\_name, SSN, BirthDay, Address, sex)

Write SQL statements to perform following tasks.

a. Create the structure of above table. (03 marks)

**create table Employee(F\_name VARCHAR(15),L\_name VARCHAR(15),SSN CHAR(9),BDate DATE,Address VARCHAR(30),Sex CHAR(2),primary key (SSN));**

b. Insert the Following Information (02 marks)

**insert into Employee values("Jone","Smith",1234,#1960-10-12#,"No 206 Huston","M");**

F name	L name	SSN	B date	Address	Sex
John	Smith	1234	1960.10.12	No 206,Huston	M
Ramesh	Nayagra n	9878	1980.10.12	No 420,Texas	M

c. Add new column salary (Salary: float) to Employee relation. (02 marks)

**ALTER TABLE EmployeeADD COLUMN Salary float;**

d. Update Smith Salary field with 35000.00. (02 marks)

**UPDATE Employee SET Salary=35000 WHERE L\_name="Smith";**

- e. Change the SSN of Smith into 1256. (02 marks)

**UPDATE Employee set SSN=1256 WHERE L\_name="Smith";**

- f. Count the number of Male Employees in above relation. (02 marks)

**SELECT count(F\_name) FROM Employee WHERE sex="M";**

- II. Following schema represent the customer and BookSales relation from database of ABC bookshop management system.

Customer(cus\_No, cus\_Name, cus\_add)

BookSales(cus\_no,ISBN,salesDate,qty)

- a. Create the structure of the BookSales relation. (03 marks)

**CREATE TABLE BookSales (cus\_no varchar(5),ISBN int,salesDate date,qty int, primary key(cus\_no,ISBN,salesDate));**

- b. List the ISBN and salesDate of all sales. (03 marks)

**SELECT ISBN,salesDate FROM BookSales;**

- c. List the cus\_no and total quantity of sales of each customer. (03 marks)

**SELECT cus\_no, Sum(qty) FROM BookSales ;**

- d. List names of the customers who buy the books on 2019/01/01. (03 marks)

**SELECT FName FROM BookSales,customer WHERE salesDate=#7/4/2019# and customer.customer\_id=BookSales.cus\_no;**

**(Total 25 marks)**

### Question 5

**[Total 25 marks]**

- I. List the two (02) advantages of database normalization process. (02x2=04 marks)

- **Data consistency**
- *Data consistency means that the data is always real and it is not ambiguous.*
- **Data becomes non redundant**
- *Non-redundant means that only copy original copy of data is available for each user and for every time. There are no multiple copies of the same data for different persons.*
- **Reduce insertion, deletion and updating anomalies**
- **Database table compaction**



- *When we normalize the database, we convert the large table into a smaller table that leads to data and table compaction. Compaction means to have the least and required size.*
- **Fast queries**
- *Better performance is ensured which can be linked to the above point. As databases become lesser in size, the passes through the data becomes faster and shorter thereby improving response time and speed.*
- *Narrower tables are possible as normalized tables will be fine-tuned and will have lesser columns which allows for more data records per page.*
- *Fewer indexes per table ensures faster maintenance tasks (index rebuilds).*

II. Explain the **functional dependency** and **transitive dependency**? (04 marks)

*FFD* If the determinant can maintain the functional dependency with a minimum number of attributes, then we call it full functional dependency.

*Or*

*If one set of attributes in a table determines another set of attributes in the table, then the second set of attributes is said to be functionally dependent on the first set of attributes.*

*TFD*-Attribute is dependent on another attribute that is not part of the primary key.

III. Consider the following DEPARTMENT Relation

<u>DepNo</u>	DName	DLocation
01	Admin	Colombo, Kandy
02	Sales	Kandy
03	Marketing	Colombo, Kandy

Convert the relation into first Normal form (04 marks)

*Dep-No D-Name*

IV. Name major three (03) anomalies available in relational database management system.

Illustrate selected two(02) anomaly with relevant example.

a. Insert anomaly

b. Update anomaly

c. Delete anomaly

(03 marks)

1) *Update Anomalies: When several instances of the same data are scattered across the database without proper relationship/link, it could cause strange conditions where a few of the instances will get updated with new values whereas some of them will not. This leaves the database in an inconsistent state.*

2) *Deletion Anomalies: Incomplete deletion of a particular data section which leaves some residual instances. The database creator remains unaware of such unwanted data as it is present at a different location.*

3) *Insertion Anomalies: This occurs when an attempt to insert data into a non-existent record.*

(02 for any two answers)

V. The following EMPLOYEE\_PROJECT relation is already in first normal form. It contains employee number (Ssn), Project number (Pnumber), working hours (Hours), Employee name (Ename), Project name (Pname) and project location(Plocation).

. Consider the functional dependencies and normalize it into second normal form.

EMPLOYEE\_PROJECT (Ssn, Pnumbe, Hours, Ename, Pname, Plocation)

Employee\_Project(SSN, Pnumber, Hours)

(03 marks)

Employee(SSN, Ename)

(02 marks)

Project(PNumber, Pname, Plocation)

(03 marks)

