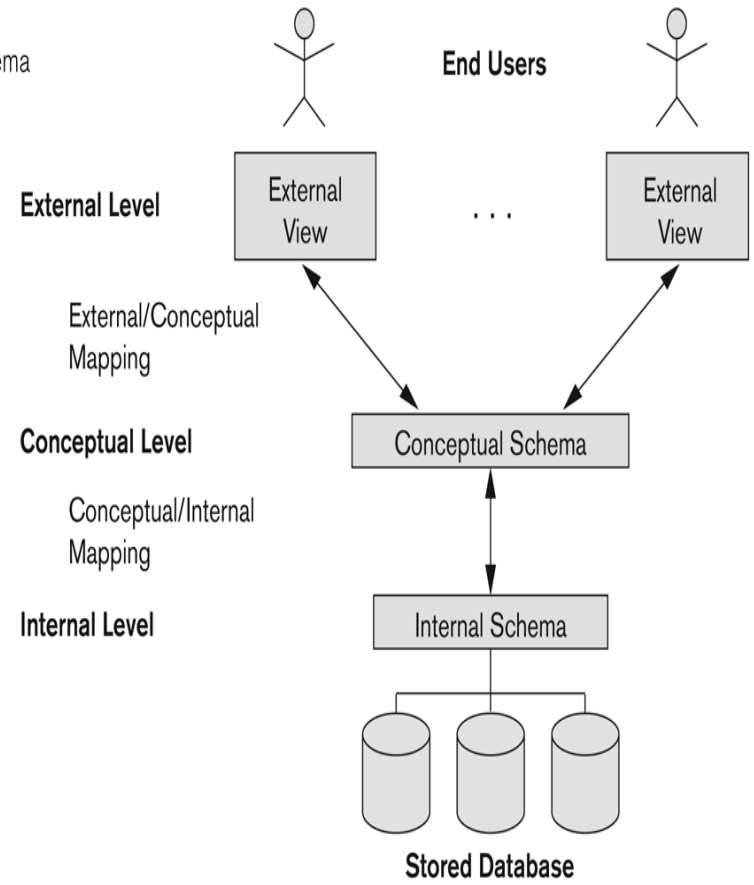
SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION
(Established in the Ministry of Higher Education vide in Act No 29 of 1995

Higher National Diploma in Information Technology

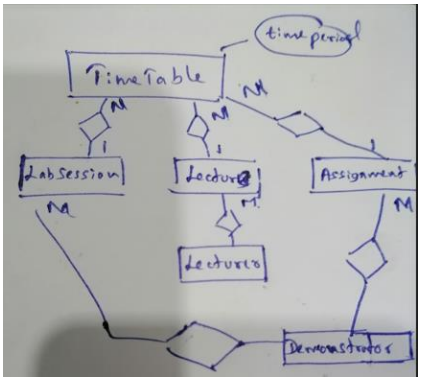
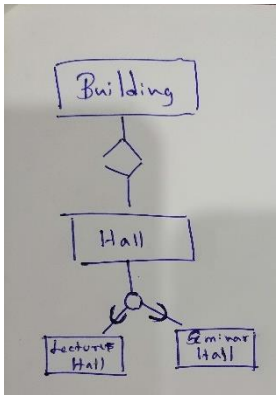
Second Year**,** First Semester Examination – 2022

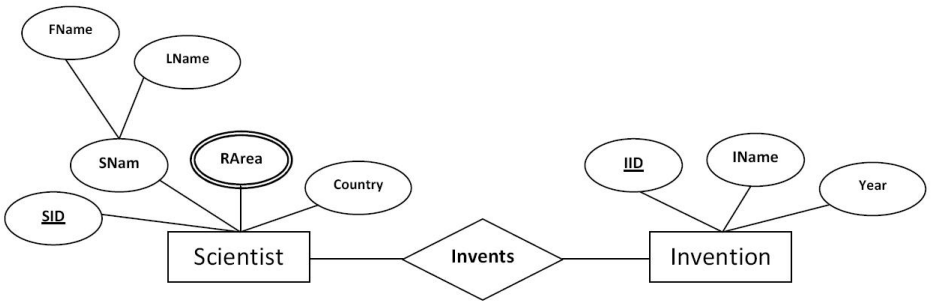
HNDIT3042- Database Management System

Model answers

Q1		
i).	What is meant by a Database Management System? • A software system that enables users to define, create and maintain the database and which provides controlled access to the database.	(04 Marks)
ii).	Draw a diagram to demonstrate the three-Schema Architecture **Figure 2.2** The three-schema architecture.  	(04 Marks)

iii).	Explain what is logical data independence and physical data independence. • **Logical Data Independence: ability to change conceptual schema without effecting appl. programs** • **Physical Data Independence: ability to change internal schema without effecting upper layers**	(06 Marks)
iv).	Briefly explain the duties of the Database administrator. • Database administrator's duties include: – Schema definition – Storage structure and access method definition – Schema and physical organization modification – Granting user authority to access the database – Specifying integrity constraints – Acting as liaison with users – Monitoring performance and responding to changes in requirements	(06 Marks)
Q2		
i).	Name different four types of database models used in creating a database. • Hierarchical database model (HDBM) • Network database model (NDBM) • Relational database model (RDBM) • Object-oriented database model (ODBM)	(04 Marks)
ii).	Briefly explain the following terms used in Relational Data Model a. Domain of the attribute b. Degree of the relation • The number of attributes of the relation is called the **DEGREE OF THE RELATION**. • The set of possible values that an attribute may have is the **DOMAIN** of the attribute.	(04 Marks)
iii).	Briefly explain the Primary keys and Candidate keys used in Relational Databases. The attribute (or attributes in combination) for which no more than one tuple may have the same value is called the primary key • Candidate keys are all attributes that may serve as the primary key. (one key is selected as a primary key)	(06 Marks)
iv).	Describe referential integrity in the relational database model. A constraint involving **two** relations Used to specify a **relationship** among tuples in two relations: The **referencing relation** and the **referenced relation**. Tuples in the **referencing relation** R1 have attributes FK (called **foreign key** attributes) that reference the primary key attributes PK of the **referenced**	(06 Marks) (20 Marks)

	relation R2. A tuple t1 in R1 is said to **reference** a tuple t2 in R2 if t1[FK] = t2[PK].	
Q3		
i).	Draw ER diagram for the scenario given below ABC university maintains semester time table to manage its lab sessions, lectures and assignments. Lectures, lab sessions and assignments are assigned to one or more two hours' time period from 8.30 to 5.00pm. Time period 12.30pm to 1.00pm is assigned to lunch break. Lecturers are assigned one or more lectures. Demonstrators are assigned to one or more lab sessions and assignments.  	(08 Marks)
ii).	Draw EER (Enhanced Entity Relationship) Diagram for the case given below. Halls belong to a particular building. There are two types of halls, lecture halls and seminar halls  	(04 Marks)
iii).	Convert the ER diagrams to the relational model given below. There is many to many relation is available between scientist and invention.	(08 Marks)



Scientist(SID , Fnaame, Lname, Country)
Invention (IID, Iname, year)
Invents (SID, IID)
ScientistRarea(SID, RArea)

02 marks x 4= 8 marks

Q4

i). Define what is the first normal form.

1st Normal Form

- A relation R is in first normal form (1NF) if domains of all attributes in the relation are *atomic* (simple & indivisible).

(04 Marks)

ii). Explain what is transitive dependency and partial dependency.

Partial Dependency:

A partial dependency occurs when a non-prime attribute (an attribute not part of any candidate key) is functionally dependent on only a part (a proper subset) of the primary key.

Transitive Dependency:

A transitive dependency exists when an attribute depends on another non-prime attribute, rather than directly on the primary key.

(04 Marks)

Examine the relation shown below and convert it to 1NF, 2NF and 3NF.

ProjectNo	Project name	Supervisor	Emp No	Emp Name	DeptNo	DeptName	HourlyRate
C001	Content Management System	Mr. A.K.Silva	E001	Mr.Amal Fernando	DA1	HR	1500
C002	POS	Mr. Mohomad	E002	Mr.AK. Silva	DA2	Accounting	5000
C003	Laravel	Mr.Asitha	E003	Mr. Kasun	DA1	HR	2000

1 NF
Relation1 (ProjectNo, ProjectName,Supervisor)
Relation2(ProjectNo,EmpNo,EmpName,DeptNo,DeptName,HourlyRate)

(12 Marks)
(20 Marks)

2NF
Relation1 (ProjectNo, ProjectName,Supervisor)
Relation2 (ProjectNo,EmpNo,HourlyRate)
Relation3(EmpNo,Empname,DeptNo,Deptname)

3NF
Relation1 (ProjectNo, ProjectName,Supervisor)
Relation2 (**ProjectNo,EmpNo,**HourlyRate)
Relation3**(EmpNo,EmpName,DeptNo)**
Relation4**(DeptNo,DeptName)**

Q5

Examine the following relation, **Book** and write a SQL statement for the questions given below.

ISBN	Title	Publisher	Author	Country
ISBN2B6	Madol Duwa	ABC Publisher	Martin Wickramasinhge	SriLanka
ISBN4B9	Head First	AKC Poublisher	Cathey Sierra	USA

i). To create a Book table (The primary key is underlined) (05 Marks)

```
CREATE TABLE Books (ISBN varchar(20) NOT NULL,Title varchar(40),
Publisher varchar(30),Author varchar(25), Country varchar(30),PRIMARY
KEY (ISBN));
```

ii). To insert the first record into Book. (03 Marks)

```
INSERT INTO Book (ISBN, Title, Publisher, Author, Country)
VALUES ('ISBN2B6', 'Madol Duwa', 'ABC Publisher', 'Martin
Wickramasinhge', 'SriLanka');
```

iii). To add a new column as price to Book table (03 Marks)

```
ALTER TABLE Book
ADD COLUMN Price DECIMAL(10, 2);
```

iv). To change the first record with “ABC Publisher” as “XYZ Publisher” (03 Marks)

```
UPDATE Book
SET Publisher = 'XYZ Publisher'
WHERE ISBN = 'ISBN2B6';
```

v). To find the book titles written by authors from Sri Lanka (03 Marks)

```
SELECT Title
```

	FROM Book WHERE Country = 'SriLanka';	
iv).	To find the all details of book written by Martin Wickramasinhge under ABC Publisher SELECT Title FROM Book WHERE author = Martin Wickramasinhge AND publisher =" ABC Publisher"	(03 Marks) (20 Marks)
Q6		
i).	State the difference between authentication and authorization. **Authorization:** The granting of a right or privilege that enables a subject to have legitimate access to a system or a system's object. **Authentication**: A mechanism that determines whether a user is who he or she claims to be.	(04 Marks)
ii).	Explain what is Discretionary Access Control (DAC). **Discretionary Access Control (DAC)** Most commercial DBMSs provide an approach called Discretionary Access Control (DAC),which manages privileges using SQL. The SQL standard supports DAC through the GRANT and REVOKE commands.	(04 Marks)
iii).	Explain the following counter measure used to protect the database. a). View b). Backup • A view is the dynamic result of one or more relational operations operating on the base relations to produce another relation. • The view mechanism provides a powerful and flexible security mechanism by hiding parts of the database from certain users. • The process of periodically taking a copy of the database and log file (and possibly programs) on to offline storage media. • A DBMS should provide backup facilities to assist with the recovery of a database following failure.	(06 Marks)
iv).	Database security is important. Do you agree? Explain your view. Yes • **DB security is concerned with avoiding the following situation:** – **Theft & fraud** – **Loss of confidentiality (secrecy)** – **Loss of privacy** – **Loss of integrity** – **Loss of availability**	(06 Marks)
