

**Question 1 (6 Marks) 1 mark for each point:** Differentiate among the following terminology

- i. Primary key, foreign key, partial key and candidate key

**Primary Key:** on or more attributes satisfy key constraints and it is chosen to be the main key in any entity. While **Candidate key** is a set of attributes that satisfy Key constrains but **are not chosen to be primary key**

On the other hand **partial key** is an attribute that exists to weak entity that is used part of primary key in physical model **foreign key** is a primary key in another table. FKs map relationships in conceptual model

- ii. Database administrator, Database designer, end users and Database developer

**Database administrator** is the person responsible for authorizing access to the database, for coordinating and monitoring its use.

**Database Designers** is the person responsible to define the content, the structure, the constraints, and functions or transactions against the database

**Database Developer** is the person responsible to map user requirements into forms and reports.

**End-user** uses the data for queries, reports and some of them update the database content.

- iii. Database Management System (DBMS) and application program

**Database Management System (DBMS)** is a software package/ system to facilitate the creation and maintenance of a computerized database. **Application program** is SW that make use of DBMS in order to control database and map user requirements from **forms and reports**

- iv. Referential integrity constraints and Primary key constraints

**Referential integrity constraint:** The value in the foreign key column (or columns) FK of the the referencing relation R1 can be either match referencing primary values or be null

While primary key constraint is that the primary key attributes PK of each relation schema R in S

- It cannot have null values
- It should be unique.

v. Conceptual data model and physical data model

Conceptual data models: Provide concepts that are close to the way many users perceive data. It contains only entity without **foreign keys** and relations while physical data models: Provide concepts that describe details of how data is stored in the computer. Foreign keys and indexes are appeared in physical models

vi. DDL, DCL and DML

DDL Data Definition language is part of SQL that is related to the stroed data of tables e.g., create, alter and drop tables

DDL Data Definition language is part of SQL that is related to the structure of tables e.g., create, alter and drop tables

DCL Data Control language is part of SQL that is related to the users and their roles in database e.g., grant, and revoke

**Question 2 (12 Marks) 2 marks for each query:** Based on the below database schema, write the following queries:

**EMPLOYEE**

FNAME	MINIT	LNAME	<u>SSN</u>	BDATE	ADDRESS	SEX	SALARY	SUPERSSN	DNO
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**DEPARTMENT**

DNAME	<u>DNUMBER</u>	MGRSSN	MGRSTARTDATE
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**DEPT\_LOCATIONS**

<u>DNUMBER</u>	<u>DLOCATION</u>
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**PROJECT**

PNAME	<u>PNUMBER</u>	PLOCATION	DNUM
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**WORKS\_ON**

<u>ESSN</u>	<u>PNO</u>	HOURS
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**DEPENDENT**

<u>ESSN</u>	<u>DEPENDENT_NAME</u>	SEX	BDATE	RELATIONSHIP
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- 1- Write SQL statement to create Table Works-on including its constraints.

```
CREATE TABLE WORKS_ON  
  ( Essn          CHAR(9)          NOT NULL,  
    Pno           INT              NOT NULL,  
    Hours        DECIMAL(3,1)     NOT NULL,  
  PRIMARY KEY (Essn, Pno),  
  FOREIGN KEY (Essn) REFERENCES EMPLOYEE(Ssn),  
  FOREIGN KEY (Pno) REFERENCES PROJECT(Pnumber) );
```

- 2- Get the name of employee who gets the lowest salary.

```
SELECT  FNAME,LNAME  
FROM    EMPLOYEE  
Where salary in (select min (salary)  
From employee)
```

- 3- Get the employee names who has no supervisor.

```
SELECT  FNAME,LNAME  
FROM    EMPLOYEE  
WHERE   SUPERSSN IS NULL
```

- 4- Retrieve the name and address of all employees who work for the 'Research' department.

```
SELECT  FNAME, LNAME, ADDRESS  
FROM    EMPLOYEE, DEPARTMENT  
WHERE   DNAME='Research' AND DNUMBER=DNO
```

- 5- For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birthdate.

```
SELECT  PNUMBER, DNUM, LNAME, BDATE, ADDRESS  
FROM    PROJECT, DEPARTMENT, EMPLOYEE  
WHERE   DNUM=DNUMBER AND MGRSSN=SSN  
        AND PLOCATION='Stafford'
```

- 6- For each project on which more than two employees work, retrieve the project number, project name, and the number of employees who work on that project.

```
SELECT  PNUMBER, PNAME, COUNT (*)  
FROM    PROJECT, WORKS_ON  
WHERE   PNUMBER=PNO  
GROUP BY PNUMBER, PNAME  
HAVING  COUNT (*) > 2
```

**Question 3 (12 Marks):** Consider a movie database in which data is recorded about the movie industry. The data requirements are summarized as follows:

- Each movie is identified by title and year of release. Each movie has a length in minutes. Each has a production company, and each is classified under one or more type (such as horror, action and drama).
- Each movie has one or more directors and one or more actors appear in it.
- The persons involved in the movie database are classified as directors, actors, and producers. Each is identified by a unique personnel id. They are also described by their first and last names and age.
- Actors are further described by other attributes such as their spoken languages and gender. While, directors are further described by their certificates. However, producers are further described by their fortune.
- Each actor has a role in the movie.
- It is possible for a director to produce and/or act in a movie (including one that he or she may also direct).
- Production companies are identified by name and each has an address. A production company produces one or more movies.
- Each production company is owned by one or more producers while each producer is participated in only one production Company.

**Design an Entity-Relationship diagram for the movie database.**

Grades for ERD:

Inheritance (4 grades (2 for inheritance + 2 for optional))

6 entities (3 grades)

4 relations (3 grades + 2 for correct relationship type e.g., many-to 1)

Multivalve attribute type of movie (1 grade)

Role **attribute on relationship** (1 grade)

