

Biological Databases: Theories and Practice (2023 Fall)

Assignment I

1. (10 points) What is the role of a **DBMS**, and what are its advantages?
2. (10 points) Please describe the differences between **Logical data independence** and **physical data independence**.
3. (10 points) Please describe the processing flowchart of a **SQL query** in a database system.
4. (15 points) Please describe the differences among **shared memory**, **shared disk**, **shared nothing**, and **hierarchical** architectures in parallel database architectures.
5. (15 points) Please use an example to describe the differences in meaning among the terms **superkey**, **candidate key**, **primary key**, and **foreign key**. And list the reasons why **null** values should be introduced into the database system.
6. (20 points) Given two relations *instructor* and *teaches*, please write down the SQL according to the following query:

<i>instructor</i>				<i>teaches</i>				
<i>ID</i>	<i>name</i>	<i>dept_name</i>	<i>salary</i>	<i>ID</i>	<i>course_id</i>	<i>sec_id</i>	<i>semester</i>	<i>year</i>
10101	Srinivasan	Comp. Sci.	65000	10101	CS-101	1	Fall	2009
12121	Wu	Finance	90000	10101	CS-315	1	Spring	2010
15151	Mozart	Music	40000	10101	CS-347	1	Fall	2009
22222	Einstein	Physics	95000	12121	FIN-201	1	Spring	2010
32343	El Said	History	60000	15151	MU-199	1	Spring	2010
33456	Gold	Physics	87000	22222	PHY-101	1	Fall	2009
45565	Katz	Comp. Sci.	75000	32343	HIS-351	1	Spring	2010
				45565	CS-101	1	Spring	2010
				45565	CS-319	1	Spring	2010
				76766	BIO-101	1	Summer	2009
				76766	BIO-301	1	Summer	2010

- (a) In relation *instructor*, find the **names** and **average salaries** of all departments whose average salary is greater than 38000.
- (b) Find the *instructor* whose **name** containing the word "E".
- (c) List the **names** of *instructors* along with the **course_id** of courses that they teach.
- (d) Find the **course_id** that is taught in Fall 2009 and Spring 2010 using **Intersect**.

7. (20 points) Consider the following Table Definition:

```
create table student (  
    ID          char(10),  
    name       varchar(30) not null,  
    dept_name  varchar(20),  
    age        int(3),  
    primary key (ID),  
    foreign key (dept_name) references department,  
    check (age >= 0));
```

- (a) What is the purpose to define: **not null** ?
- (b) What is the purpose to define: **primary key** (*ID*) ?
- (c) What is the purpose to define: **foreign key** (*dept_name*) **references** *department*?
- (b) What is the purpose to define: **check** (*age* >= 0) ?