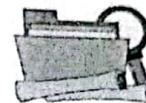


# Database System

## Lab- 01



### Task 01

University of Punjab has been storing the data of students in hard form on registers for a long time. The Management has heard about the new technology in market "Storing Data in form of files in computer system". Having heard about its benefits such as Quick access, Automation, space saving, capacity and backup and recovery, University management has decided to shift its structure to File Handling. For this task, they need your help.

Make a Menu based program in python. All the actions will be performed on a text file named as "students.txt". The program should provide the User with multiple options such as:

#### 1. Add new Student Record

A new student record will be added to the file student.txt. For a new student record, provide information about student such as:

- *Roll number*
- *Name*
- *Father's name*
- *CNIC*
- *DateOfBirth*
- *Section*
- *CGPA*

#### 2. Display all Student Records.

Display all the records that are stored in file student.txt.

#### 3- Update a student Record.

Take the roll number of a student as input from the User and take the new data values from user for that student, then update that record in the file.

#### 4- Delete a student Record

Take the roll number of the student as input from User and delete the record of that student from the file.

#### Main Function:

The main function should be Menu-based. Meaning allow User to select one of the above options and also and Exit, option. This menu should keep on appearing to the user until they select the Exit option.



## Faculty of Computing & Information Technology

### Database Systems Lab

BS(SE) Morning - Fall 2022

LAB - 02

**The objective of this lab is to:**

1. Introduction to SQL language
2. Basic SQL queries.

**Total Marks: 45**

**Course & Lab Instructor: Dr. Sanam Ahmed**

Kindly paste the query as well as result table screenshot as a result of each task

**Sample:**

Display All the Employees from emp table

**Solution:**

Select \* from emp

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7839	KING	PRESIDENT	-	11/17/1981	5000	-	10
7698	BLAKE	MANAGER	7839	05/01/1981	2850	-	30
7782	CLARK	MANAGER	7839	06/09/1981	2450	-	10
7566	JONES	MANAGER	7839	04/02/1981	2975	-	20
7788	SCOTT	ANALYST	7566	12/09/1982	3000	-	20
7902	FORD	ANALYST	7566	12/03/1981	3000	-	20
7369	SMITH	CLERK	7902	12/17/1980	800	-	20
7499	ALLEN	SALESMAN	7698	02/20/1981	1600	300	30
7521	WARD	SALESMAN	7698	02/22/1981	1250	500	30
7654	MARTIN	SALESMAN	7698	09/28/1981	1250	1400	30

More than 10 rows available. Increase rows selector to view more rows.

**Task 01:**

[10 Marks]

1. List all rows of the table DEPT.

2. List ENAME, DEPTNO, JOB, SAL and ANNUAL SAL of the table EMP
3. List the names and department numbers of employees who have a commission (COMM) greater than 500.
4. List the names of employees who do not have a commission.
5. List all employees who are not CLERK.
6. List all employees who are not CLERK and not working in department number 10 or 20.
7. Find all employees who are either SALESMAN or ANALYST with salaries in the range of 1500 and 3000.
8. List all employees who are either MANAGER of department number 30 or are SALESMAN.
9. List all employees from EMP table working in either deptno 10 or 20
10. Change the Column Heading Job into Designation without using alias.

**Task 02:**

**[2 Marks]**

1. Will this statement execute successfully? (1 mark)

**SeLeCt dNaMe fRom EmP**

2. Identify all possible errors in the statement. (2 marks)

**Select ENAME as Name of Employee, Job, Sal, Sal x 12 as salary from emp.**



## **Database Systems Lab**

**BS(SE) Morning - Fall 2022**

**LAB – 04**

**Course & Lab Instructor:** Dr. Sanam Ahmed

**Total Marks: 40**

**Time allowed: 75 mins.**

### **Task 01** **(20 Marks)**

1. Write an sql Query that firsts extract Day from the Hiredate  
E.g ( "12/17/1980") the day is 17.
2. Display all names of the employess and make a second column named “pos3 to pos6” and print the characters from position 3 to position 6 from the names in ename.  
Make a third column that display stars with each asterik signifying 500 dollar .  
for example - three stars should be for all employees having salary between 1500 to 1999.
3. The employees get one extra sal upon the completion of three financial years (Jul to June). Write a query to find the number and amount of extra salaries that employees have got to date.
4. Select all the employees from emp table and display a column such that the first 2 digits of empno are concatenated with the last half of the name. Also add number of dollar Sign '\$' to the left and right side, equal to the length of the name.
5. Display employee number of salesman in format '7,3,9,6'.
6. Write a query to tell the date of next Monday After each employee's hiredate.
7. Display all employee's whose experience in years is an Even Number.
8. Use a date function to find out first date of current year and the first date of this month.  
Display each of two in columns with names as '1st Date of Year' and '1st Date of Month'.
9. Write a query to display the ENAME, HIREDATE, and their tenure for those who were hired in the years 1980 to 1982
10. Write a query to give the position of the first occurrence of Letter 'A' in job.Also display a column of jobs. JOBS SHOULD NOT BE REPEATED.

## Task 02

**(20 Marks)**

1. List Employees who are either in department 10 or 20 and they earn more than 25000 yearly.
2. List employees who have earned more 10,000 as the collective salary of <sup>half</sup> ~~have~~ of their service.
3. List employees for which the manager id is 7639 and they work as MANAGER or SALESMAN.
4. List those employee who have been hired in second half of 1982.
5. Display first two letter of the first and last two letter from the last name of the names in pucit table. For example If name is Muhammad Jafar then output should be like Mu-ar.
6. Display the Reversed the names in PUCIT table such that Last name is Displayed first and First name is displayed later.
7. Display Department names of each Employee. Dept number 10 name is "IT", 20 is "SE", 30 is "CS".
8. Calculate TAX for employees such that if they earn more than 40 thousand annually they will pay 30% Tax, if more than 30,000 then 20%, if more than 20,000 than 10% and for rest only 5% tax.
9. List employees with their experience such that for employees who have more than 40 years experience are LEGEND, more than 30 are Highly Experienced, more than 20 are Experienced and other than that are JUNIOR.
10. List all the Employees with their name, job, salary and comm plus create a column "Commission" which will have values Yes or No. Yes for employees who earn commission and No for who don't.



## **Database Systems Lab**

**BS(SE) Morning - Fall 2022**

### **LAB – 05**

**Course & Lab Instructor:** Dr. Sanam Ahmed

- Kindly paste the query as well as result table screenshot as a result of each task

**Sample:**

Display All the Employees from emp table

**Solution:**

Select \* from emp

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7839	KING	PRESIDENT	-	11/17/1981	5000	-	10
7698	BLAKE	MANAGER	7839	05/01/1981	2850	-	30
7782	CLARK	MANAGER	7839	06/09/1981	2450	-	10
7566	JONES	MANAGER	7839	04/02/1981	2975	-	20
7788	SCOTT	ANALYST	7566	12/09/1982	3000	-	20
7902	FORD	ANALYST	7566	12/03/1981	3000	-	20
7369	SMITH	CLERK	7902	12/17/1980	800	-	20
7499	ALLEN	SALESMAN	7698	02/20/1981	1600	300	30
7521	WARD	SALESMAN	7698	02/22/1981	1250	500	30
7654	MARTIN	SALESMAN	7698	09/28/1981	1250	1400	30

More than 10 rows available. Increase rows selector to view more rows.

### **Task 01**

**(20 Marks)**

- Find all employees whose second character in their names is S OR their names contain a hyphen (-).

2. Count Number of A's In the name of each employee.
3. Display Blake's name and his Job. But remove the B from his name and name the first column "Blake without a b". For the second column display the length of Blake's name after removal of b and name the column "Length of Blake".
4. Display the salary of all employees in format '\$20,000.00' who work as managers.
5. Show the date which will arrive right after half and a quarter year in a column.
6. Display the EMPNO along with its reversed number using substr function.
7. Your task is to generate email for all the employees. Email should be of the following format:  
`<name><empno>@pucit.edu.pk`. All alphabets must be in small case. You can only use CONCAT for this.
8. Write a query to display the week no of a month in which employee is hired.
9. Find employees whose name starts with 'A' and ends with 'n'.
10. Find employees who were hired in December of any year using like operator.

## **Task 02**

**(15 Marks)**

1. Display EMPNO, ENAME, JOB, SAL, deptno, Dname of all the employees. Use Decode function to map deptno to the corresponding dname available in the dept table.
2. Write a query to display the ENAME and their HIREDATE in the format 'YYYY-MM-DD' and convert the DEPTNO to a character string.
3. write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with j, k, or s (both capital and small). give each column an appropriate name
4. Write a query to display employee details EMPNO,ENAME,JOB,MGR, a formatted HIREDATE, and a concatenated string of JOB and DEPTNO. Include only those employees hired after January 1, 1981. If the manager is null, display "No Manager".
5. Write a query to display the student names (STD\_NAME) from the PUCIT table. If a student has a middle name, display their name as "First Name – Middle Name First Letter - Last Name". If a student does not have a middle name, display their name as "First Name - N/A - Last Name".

## **Task 03 VIVA**

**(5 Marks)**



## Database Systems Lab

BS(SE) Morning - Fall 2022

LAB – 06

**Course & Lab Instructor:** Dr. Sanam Ahmed



**Kindly paste the query as well as result table screenshot as a result of each task**

### Task 01

**(20 Marks)**

1. List the job titles and the total number of employees for each job title.
2. How many Employees are there who are manager and earn no commission.
3. Display the Minimum Salary, Maximum Salary, Average Salary and Sum of all Salaries in four different columns. The column names should be proper.
4. Find the percentage of the number of employees who are not receiving any commission.
5. What is the total yearly salary paid in each department.
6. What is the total number of employees hired each year.
7. List all employees in decreasing order w.r.t sal.
8. What is the average length of service (in years) for employees in each department, considering only those who have been with the company for more than 3 years?
9. What is the total and average salary for each combination of department and job title.
10. What is the average number of years employees stay in the company for each department?

### Task 02

**(20 Marks)**

1. Create a table named student with the following attributes:
  - Roll (number)(Primary key)
  - name (string)
  - program (string)
  - section (string)
  - dateofbirth (date)

- dateofenrollment (date)

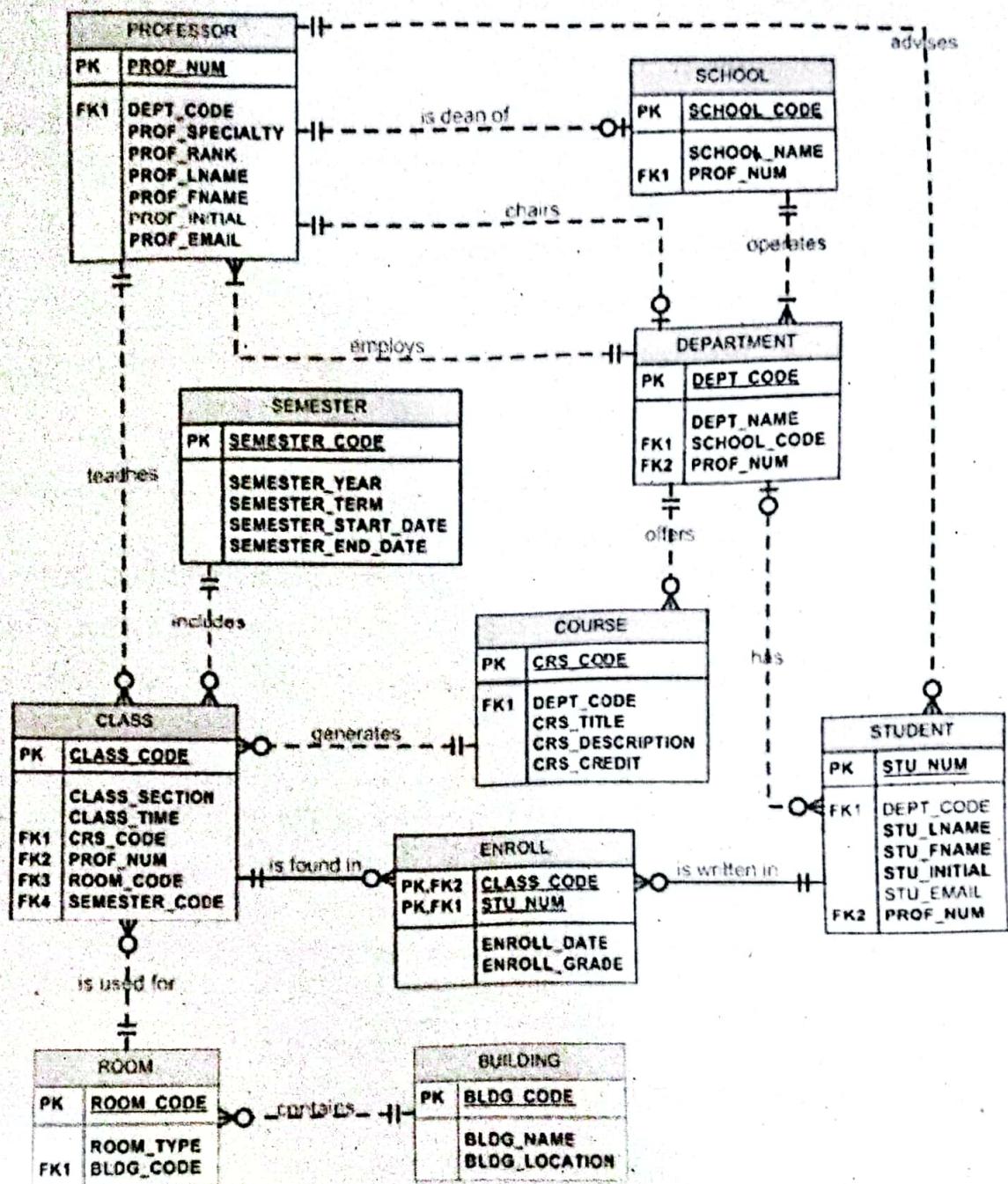
Insert 3 records in this table and display them.

2. Now you have to update the names of first 2 students in the previously created "student" table. Display these 2 records with the updated values now.
3. We have decided that we want to delete the record for the student 2. Delete it from student table and display the remaining content in the table.
4. Create a table Teacher:  
Id (number) (pk)  
Name (string)  
Department id (number)  
Department Name (string)  
Program: (string)
5. Insert 3 records in the Teacher table and display them.
6. Update a teacher's department name and id on Teacher table and display the updated values.
7. Delete 2 records in the Teachers table and show the remaining content of the table.
8. List down the employees who earn more than 50k yearly from each Job.
9. List down the Max earning employee from each department.
10. List down department with the most number of employees.

### **Task 03 VIVA**

**(5 Marks)**

# ERD of Emperial College Class Sceduleing



### **Question 1:**

Explain the above ER Diagram. You must mention all the tables, their relationship with other tables (describe what kind of relation it is and what does it mean?) Also provide the quick overview of technical working of the whole system that will be created from this E.R.D.  
MARKS [20]

### **Question 2:**

Write DDL statements to create each table mentioned above according to the structure mentioned in the ER Diagram. Also you are to specify the constraints for each table while creating the tables. MARKS [100]

- **Professor Table Constraints:**

- Prof\_num is primary key.
- Dept\_Code must be exact of 3 characters long.
- Prof\_email has '@'character included in their mail.

- **School Table Constraints**

- SCHOOL\_CODE is the primary key.
- PROF\_NUM is a Foreign key referencing to PROF\_NUM column in Professor table.

- **Department Table Constraints**

- DEPT\_CODE is the primary key.
- SCHOOL\_CODE is a foreign key referencing SCHOOL\_CODE in the School table.
- PROF\_NUM is a foreign key referencing PROF\_NUM in the Professor table.

- **Semester Table Constraints**

- SEMESTER\_CODE is the primary key.
- SEMESTER\_Year is unique.
- Start\_date is less than end\_date.

- **Course Table Constraints**

- CRS\_CODE is the primary key.
- DEPT\_CODE is a foreign key referencing DEPT\_CODE in the Department table.

- **Class Table Constraints**

- CLASS\_CODE is the primary key.
- CRS\_CODE is a foreign key referencing CRS\_CODE in the Course table.
- PROF\_NUM is a foreign key referencing PROF\_NUM in the Professor table.
- ROOM\_CODE is a foreign key referencing ROOM\_CODE in the Room table.
- SEMESTER\_CODE is a foreign key referencing SEMESTER\_CODE in the Semester table.

- **Student Table Constraints**

- STU\_NUM is the primary key.
- DEPT\_CODE is a foreign key referencing DEPT\_CODE in the Department table.
- PROF\_NUM is a foreign key referencing PROF\_NUM in the Professor table.
- Stu\_email has '@' character included in their mail.

- **Enroll Table Constraints**

- Composite primary key consisting of CLASS\_CODE and STU\_NUM.
- CLASS\_CODE is a foreign key referencing CLASS\_CODE in the Class table.
- STU\_NUM is a foreign key referencing STU\_NUM in the Student table.

- **Room Table Constraints**

- ROOM\_CODE is the primary key.
- BLDG\_CODE is a foreign key referencing BLDG\_CODE in the Building table.

- **Building Table Constraints**

- BLDG\_CODE is the primary key.
- BLDG\_Name is not empty.
- BLDG has default value "My Building".

**Question 3:** Now you have created all tables, lets say we want to make changes to table's structure. Write the queries to make changes:

1. Write the SQL query to insert new Professor record MARKS [5]
2. Write the SQL query to insert new Department record MARKS [5]
3. Write the SQL query to insert new Student record. At least insert 5 distinct students records MARKS [10]
4. Write SQL queries to insert all courses of your current semester in courses table MARKS [10]
5. Write SQL queries to enroll all 5 students' students in all the courses of your current semester MARKS [15]

Write SQL queries to insert all classes of your current semester in classes table with assigned teachers/professors, buildings and rooms. MARKS [20]



## Database Systems Lab

**BS(SE) Morning - Fall 2022**

**LAB – 10**

**Course & Lab Instructor:** Dr. Sanam Ahmed

**Task 01**

**(50 Marks)**

1. Find the department name of the most Senior employee.
2. List all employees whose salary is greater than the average salary of the employees working in department 'dallas'.
3. Find employees who have the same dept and job as employee ID 7369, but not including employee ID 7369. Also show dept name and job of that employee.
4. List all employees with the same job as is the job of SMITH, but salary lower than SMITH'S salary.
5. Find the job with the lowest average salary.
6. Find all departments that do not have any employees.
7. Find the names of employees who have a higher salary than the employee with the highest commission.
8. List all employees in department 20 who have a manager in department 10.(only to be solved by subquery)
9. List employee id, name, salary, comm, department name and average salary of that department and follow same outputorder.
10. List employees who have a salary greater than the salary of at least one employee in department 10 and at least one employee in department 30
11. Find the employee name, empno, department name and salary grade who have a salary grade greater than or equal to salary grade of highest paid employees in department 20.
12. Find the department with the highest total salary.
13. Find the Manager of 'BLAKE'.
14. Find Employees Who Were Hired Before the Earliest Hire Date in Department 10.
15. Find the Employees Who Work in the Same Department as the Employee with the Highest Commission.
16. Write a Query that calculates the highest Salaries of each Department along with the department name and employee name.

EMPLOYEE INFORMATION			
ACCOUNTING	10	KING	5000
RESEARCH	20	FORD	3000
RESEARCH	20	SCOTT	3000
SALES	30	BLAKE	2850

4 rows returned in 0.01 seconds [Download](#)

17. List employees who have a salary greater than the salary of at least one employee in department 10 and at least one employee in department 30
18. Display the employees whose salary is within the same grade range as the average salary of all employees.

EMPLOYEE ID	EMPLOYEE NAME	DEPARTMENT	HIRE DATE	SALARY	GRADE	COMMISSION %	MANAGER ID	NUMBER OF EMPLOYEES
7698	BLAKE	MANAGER	7839 05/01/1981	2850	-	30	4	
7782	CLARK	MANAGER	7839 06/09/1981	2450	-	10	4	
7566	JONES	MANAGER	7839 04/02/1981	2975	-	20	4	
7788	SCOTT	ANALYST	7566 12/09/1982	3000	-	20	4	
7902	FORD	ANALYST	7566 12/03/1981	3000	-	20	4	

19. List employee id, name, salary, comm, department name and MAX salary of that department and follow same output order.

EMPLOYEE ID	EMPLOYEE NAME	SALARY	COMM	DEPARTMENT	MAX SALARY
7369	SMITH	800	0	RESEARCH	3000
7499	ALLEN	1600	300	SALES	2850
7521	WARD	1250	500	SALES	2850
7566	JONES	2975	0	RESEARCH	3000
7654	MARTIN	1250	1400	SALES	2850
7698	BLAKE	2850	0	SALES	2850
7782	CLARK	2450	0	ACCOUNTING	6000
7788	SCOTT	3000	0	RESEARCH	3000
7839	KING	5000	0	ACCOUNTING	6000
7844	TURNER	1500	0	SALES	2850

More than 10 rows available. Increase rows selector to view more rows.

20. Display the department name having number of employees less than the average number of employees in each department.

DEPARTMENT	DEPT NO
ACCOUNTING	10

21. Find employees who are the only ones in their department with their job title.

EMPLOYEE ID	EMPLOYEE NAME	DEPARTMENT	HIRE DATE	SALARY	GRADE	COMMISSION %	MANAGER ID	NUMBER OF EMPLOYEES
7566	JONES	MANAGER	7839 04/02/1981	2975	-	20		
7698	BLAKE	MANAGER	7839 05/01/1981	2850	-	30		
7782	CLARK	MANAGER	7839 06/09/1981	2450	-	10		
7839	KING	PRESIDENT	- 11/17/1981	5000	-	10		
7900	JAMES	CLERK	7698 12/03/1981	950	-	30		
7934	MILLER	CLERK	7782 01/23/1982	1300	-	10		

22. Display the employees whose salaries fall in the top 10% of their salary grade range
23. Find employees whose salary is above the average salary of employees in the same department who are managed by the same manager.
24. Display the manager name having maximum no of employees working under him.
25. Display all employees who were hired in the same month as any employee from department 10.