National University of Computer and Emerging Sciences, Karachi
Fall – 2021, FAST School of Computing
Final Examination
04th January 2021, 09:00am – 11:00am

Course Code: CL2005	Course Name: Database Systems Lab
Instructor Name(s): Amin Sadiq, M.Ali Shah Fatmi, Erum Shaheen, Fizza Aqeel	
Student Roll Number:	Section:
Total Time: 120 Minutes	Total Points: 50 points

Instructions:

- Return the question paper and mention your **student roll number on it.**
- Read each question completely before answering it. **There are 3 questions on 2 pages.**
- Attempt all the given questions. **All questions are carrying different points.**
- Create a single text file and copy all your script in a single text file, mention Question no against each script.
- Submit .txt file in GCR, file name should be as your roll number like (K191234.txt).
- Last **10-15 minutes** is for **uploading the material** on your specific **Google classroom.**
- **Cheating in any case will lead to F-GRADE as per university rule.**
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.

Question # 1 (SQL Queries) **[Estimated Time: 30 Minutes]** **[20 Points]**

1. Write a query to find the employees who have worked in more than one department and show employee start and end date in the department.
2. Write a query to find the total salary and average salary of each department.
3. Write a query to find no of employee that belongs to each country.
4. Write a query to find which department were paid highest and lowest in terms of salary and show department's total number of employees.
5. Write a query to find the 10 most senior employee and their tenure period.
6. Write a query to find the Department ID, Department Name, Manager Name, Manager Salary and Department City.
7. Write a query to find which state has the highest employees.
8. Write a query to find the average tenure period of each department from Job History table.
9. Write a query to find the total number of employees with respect to country and city.
10. Write a query to find the no of employees that belongs to each region.

Question # 2 (PL SQL) **[Estimated Time: 70 Minutes]** **[25 Points]**

Recently an audit is taken by the external audit team and they found few anomalies in your database. Their observation were under as follows. **[12 Points]**

Part A

1. No record is maintained of the events when the DDL operation is performed.
2. Although events record is maintained for the DML operation but when the update operation is performed the old record is cleared from the database and there is no procedure to trace the records previous values.

3. **Change Data Capture** and **Change Table** are the two features that can be enabled on the database. These are used to determine the **DDL** operation such as create, alter, drop and **DMLs** such as insert, update, and delete SQL operations that were made to the user tables in the database.
   a. Create trigger for DDL operation and save the entity name, user name, operation name, time of event in the separate table.
   b. Create trigger for the DML operation and save the user name, time of the event, operation name, previous and new values of the record of the DML operation.

[13 Points]

Part B

1. It is observed that there is more use of complex queries in the application layer which is creating run time overhead due to compilation of those queries, also compromising the data security and data integrity.
   a. Write a stored procedure to increment the monthly salary of the employee from HR database. Stored procedure will receive the Employee ID is an IN parameter The mathematical formula of the increment is
      i. salary+5000 +1000 *(total employment years)
      ii. total employment years = current date – hire date
   b. Write a stored function to join Regions Table, Location table and Employee Table (only Employee ID, Employee Name, Employee Contact Number)

[5 Points]

Question # 3 (No SQL) **[Estimated Time: 10 Minutes]**

FAST NU has given an advertisement for the hiring of nosql database engineer for their university portal. The development of the portal is under process. The portal will contain information of university student, staff, faculty and departments. You appear for an interview and the interviewer has given you some tasks to perform. If you perform all the tasks correctly, then you will be hired as a nosql database engineer. The task is given below:

1. You have to write a single query that will create collection of students and insert atleast 2 multiple records (having different values) at same time. The collection will contain fields like id, first name, last name, age, email address also there is an embedded document of department which shows that in which department, student was enrolled. The field of embedded documents are id, department_name.
2. Now you have to find out those documents which are having age greater than 20 but less than 30. Show the data in formatted way.
3. Lastly, delete atleast 1 inserted data of your own choice.