National University of Computer & Emerging Sciences, Karachi
Fall-2023 School of Computing (BSCS, BSSE, BSCY, BSAI)

Assignment # 02

Subject: Database Systems -CS2005	**Post Date: 03/10/2023**
Total Marks: 30	**Due Date:** 09/10/2023
Course Instructors: Dr. Zulfiqar Memon, Dr. Anam Qureshi, Ms. Romasha Khurshid, Mr. Shahroz Bakht, Ms. Fizza Aqeel, Ms. Fizza Mansoor, Mr. Omar Qureshi, Ms. Abeer Gauhar, Mr. Muhammad Ali Fatimi	

Instructions to be strictly followed.

- For all questions involving SQL Queries:
  - ***Submit the SQL Scripts in a .txt file.***
- It should be obvious that submitting your work after the due date will result in zero points being awarded.
- Plagiarism (copying/cheating) and late submissions result in a zero mark.

Question #01: **Marks /15**

Using the Sailors-Boats-Reserves relational database schema shown below, specify the following queries using the relational operators discussed in the class.

Sailors (sid, sname, rating, age)
Boats (bid, bname, color)
Reserves (sid, bid, date)

Write each of the following queries in Relational Algebra.

1. Find the colors of boats reserved by Albert.
2. Find all sailor id's of sailors who have a rating of at least 8 or reserved boat 103.
3. Find the names of sailors who have not reserved a red boat.
4. Find the sailor id's of sailors with age over 20 who have not reserved a red boat.
5. Find the names of sailors who have reserved at least two boats.
6. Find the names of sailors who have reserved all boats.
7. Find the names of sailors who have reserved all boats called BigBoat.
8. Find the sailor id's of sailors whose rating is better than some sailor called Bob.
9. Find the sailor id's of sailors whose rating is better than every sailor called Bob.
10. Find the sailor id's of sailors with the highest rating.

Question #02: **Marks /15**

Consider a database with the following schema:

Person (name, age, gender)
Frequents (name, pizzeria)
Eats (name, pizza)
Serves (pizzeria, pizza, price)

Describe the relations that would be produced by the following relational algebra operations (Textual meaning required) and also write SQL Query of each statements:

a. $\pi_{\text{pizzeria}}\left(\sigma_{\text{age}<18}(\text{Person}) \bowtie \text{Frequents}\right)$

b. $\pi_{\text{name}}\left(\sigma_{\text{gender}='\text{female}' \wedge (\text{pizza}='\text{mushroom}' \vee \text{pizza}='\text{pepperoni}')}(\text{Person} \bowtie \text{Eats})\right)$

c. $\pi_{\text{pizzeria}}\left(\sigma_{\text{name}='\text{Amy}'}(\text{Eats}) \bowtie \sigma_{\text{price}<10}(\text{Serves})\right)$

d. $\pi_{\text{name}}(\text{Person}) - \pi_{\text{name}}\left(\text{Frequents} - \pi_{\text{name, pizzeria}}(\text{Eats} \bowtie \text{Serves})\right)$

e. $\pi_{\text{name}}(\text{Person}) - \pi_{\text{name}}\left(\pi_{\text{name, pizzeria}}(\text{Eats} \bowtie \text{Serves}) - \text{Frequents}\right)$