Comp2411 Database Systems **Fall 2022**

Homework Assignment #1

(Due: Friday 07/Oct/2022 (to submit via Blackboard System!))

Question A. (Totally **50 marks**)

1) A database is being constructed to keep the record of all airlines, airplanes and (inboarding/outboarding) flights operated in an airport. Each airline company has a number of airplanes. Each airplane has an unique identify number, model number(ex. BOE-747, AIRBUS-A380) and other information (like number of seats and so on). It is desirable for the database to keep track of the airline and airplane on each flight. Each flight should have the departure airport which may include airport name, city, capacity, etc. While each flight only has one departure airport to start from, it may have more than one stop place (airport). Design an ER schema diagram for this application, stating any extra assumptions you'd like to make. [30 marks]

2) For your ER diagram given above, convert it into a relational schema using the mapping guidelines discussed in the lecture. For each relation (table) obtained, specify the name and its attributes, as well as its primary key.

[20 marks]

Question B. (Totally **50 marks**)

A database schema consisting of three relations STUDENT, COURSE, and STAFF is created as follows:

```
CREATE TABLE STUDENT (STU_ID          CHAR(4),
        STUDENT_NAME                  CHAR(20),
        ADDRESS                       CHAR(20),
        BIRTHDATE                     DATE,
        GENDER                        CHAR(6));

CREATE TABLE COURSE (COURSE_ID        CHAR(6),
        COURSE_TITLE                  CHAR(20),
        STAFF_ID                      CHAR(3),
        SECTION                       NUMBER(2));

CREATE TABLE STAFF (STAFF_ID          CHAR(3),
        STAFF_NAME                    CHAR(20),
        GENDER                        CHAR(6),
        DEPARTMENT                    CHAR(20),
        BOSS_ID                       CHAR(3)
        SALARY                        NUMBER(8,2));
```

Formulate and test in ORACLE SQL the following queries, and save your answer into a file*.

1) Find out the information of staff members who are female and earn either below $5,000 or above $30,000. [5 marks]
2) List all staff members who are neither in the Accounting department nor the History department. [5 marks]
2) List all students whose name contains the substring "JONES". List the females before the males in chronological order (by birthdate). [6 marks]
4) List all the courses taught by Raymond J. JOHNSON. [6 marks]
5) Find the names of all staff members who earn more than their bosses. [8 marks]

6) List all staff members who are either in the same department as Amy Dancer or Jack Nelson. [8 marks]

7) Find the names of the staff members who make more money than every member of the Accounting department. [7 marks]

8) Find the average salary for each department which has more than three staff members. [5 marks]

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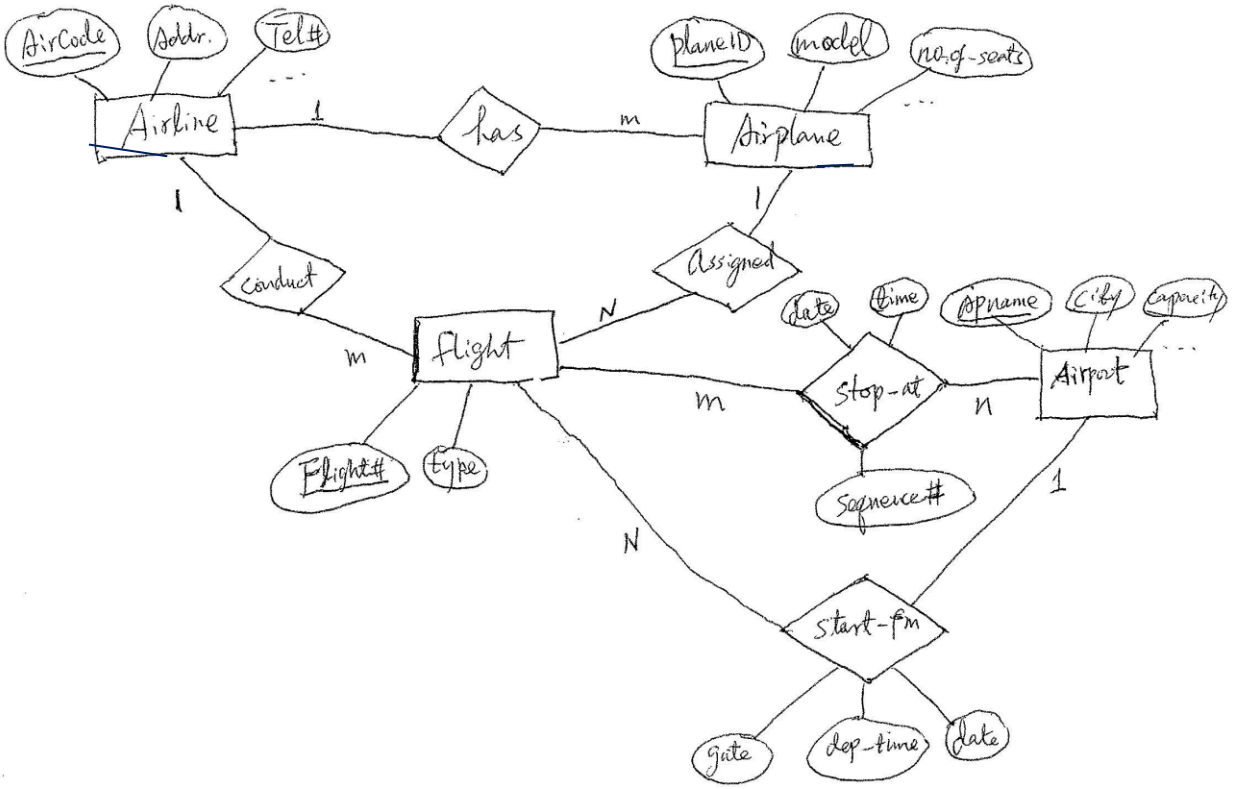
*Remark 1: Please remember to include your name and student ID# in each of your answer sheets for Question A; upload a scanned copy of your answers.

Remark 2: As a suggestion, please test out your answers on the Oracle DBMS first before submitting your answers! For submission, you may concatenate all the solutions for individual queries into a combined one and upload it to the BB System.

Sample Solutions for Homework#1

Question A. **(30 marks)**

1) Answer:



(**Note**: an equally acceptable (and possibly more natural) design would be to model Flight as a weak entity set which is dependent on Airline and Airplane, in which case its attribute "Number" would be a partial key (underlined by dashed line), and the relationship "conduct" would become the identifying relationship, ie, in double line diamond.)

2) ***Answer:*** **(20 marks in total)**

//note that a table for a 1:M relationship (diamond) can be saved/skipped with proper adjustment of the table on the M side…

Airline(**AirCode**, Address, Telephone, …)

AirPlane(**PlaneID**, Model, No.ofSeats, …, AirCode)

Airport(**APname**, City, Capacity, …)

Flight(**Flight#**, Type, AirCode, PlaneID, APname, Date, Depart-time, Gate)

Stops-At(**Flight#, APname**, Sequence#, Date, Time)

Question B. (totally 5**0 marks**)

1).
```
SELECT * FROM STAFF WHERE (SALARY < 5000 OR SALARY > 30000)
                                    AND GENDER = 'FELAME';
```
(5 marks)

2).
```
SELECT * FROM STAFF WHERE DEPARTMENT NOT IN ('ACCOUNTING','HISTORY');
```
(5 marks)

3).
```
SELECT * FROM STUDENT WHERE STUDENT_NAME LIKE '%JONES%'
                                      ORDER BY GENDER, BIRTHDATE;
```
(6 marks)

4).
```
SELECT * FROM COURSE
        WHERE STAFF_ID = (SELECT STAFF_ID FROM STAFF
                                    WHERE STAFF_NAME = 'Raymond J. JOHNSON');
```
(6 marks)

5)
```
SELECT STAFF_NAME FROM STAFF E
         WHERE SALARY > (SELECT SALARY FROM STAFF B WHERE B.STAFF_ID = E.BOSS_ID);
```
(8 marks)

6).
```
SELECT * FROM STAFF
        WHERE DEPARTMENT IN (SELECT DEPARTMENT FROM STAFF
                                      WHERE STAFF_NAME = 'Amy Dancer' OR STAFF_NAME = 'Jack Nelson');
```
(8 marks)

7).
```
SELECT STAFF_NAME FROM STAFF
        WHERE SALARY > ALL(SELECT SALARY FROM STAFF
                                    WHERE DEPARTMENT = 'ACCOUNTING');
```
(7 marks)

8).
```
SELECT DEPARTMENT,AVG(SALARY)
        FROM STAFF
        GROUP BY DEPARTMENT HAVING COUNT(*) >3;
```
(5 marks)