ISYS2120 Revision Questions

Note: these questions cover some of the examinable content, but the exam format is not necessarily the same as what we have here. For detailed description of the exam format, see week 13 lecture. Some of these questions are adapted from previous years exams.

A

Consider the following relational schema which stores information about members of an organisation, and activities they are working on.

```
CREATE TABLE Member(
      MemberID INTEGER,
      Name VARCHAR(20) NOT NULL,
      Joined DATE NOT NULL,
      Role VARCHAR(10),
      Location VARCHAR(10),
      PRIMARY KEY (MemberID)
)
 CREATE TABLE Activity(
      ActivityID INTEGER,
      ActivityType VARCHAR(10) NOT NULL,
      Leader INTEGER,
      Duration INTEGER NOT NULL,
      PRIMARY KEY (ActivityID),
      FOREIGN KEY (Leader) REFERENCES Member(MemberID)
 )
 CREATE TABLE WorksOn(
      MemberID INTEGER,
      ActivityID INTEGER,
      DaysWorked INTEGER.
      PRIMARY KEY (MemberID, ActivityID),
      FOREIGN KEY (MemberID) REFERENCES Member(MemberID),
      FOREIGN KEY (ActivityID) REFERENCES Activity(ActivityID)
)
```

A(i) [4 minutes] Write a SQL query to run against the activity management schema, that will output a list of how many activities there are, whose duration is more than 2 days and where the activity leader has role 'Tester".

A(ii) [4 minutes] Write a SQL query to run against the activity management schema, that will produce a report showing, for each activity, how many members worked on that activity for more than 3 days.

A(iii) [5 minutes] Write a SQL query to run against the activity management schema, that will output the total hours worked by members on the activity whose activityID is 57, assuming hat a day of work is 8 hours. So, for example, if member 20 worked for 2 days on this activity, and member 41 worked for 3 days on this activity (and no other members worked on it), then the hours worked on the activity would be (2+3)*8 = 40.

A(iv) [6 minutes] Write a SQL query to run against the activity management schema, that will output the AcivityID of the activity with the greatest duration,

among activities whose ActivityType is “Testing”. If more than one of the activities with appropriate ActivityType have the same greatest duration, your query should list all of the considered activities which have that duration, in numerical order by ActivityID.

A(v) [5 minutes] In the activity management schema, the column Leader in table Activity, is a foreign key referencing the Member table. Describe in English, what restrictions this puts on the contents of the table.

A(vi) [5 minutes] Write a relational algebra expression involving the tables in the activity management schema mentioned in Question A, whose result will answer the request “Find the Name of any member who worked for more than 3 days on an activity whose ActivityType is “Testing”

A(vii) [5 minutes] Supposer the activity management schema was created by user Jane. Write one or more SQL commands which Jane could execute in order to enforce the policy that user Joe can see information on names and roles of members who work on the activity whose ActivityID is 39, but Joe can’t see other information or modify any information in the database.

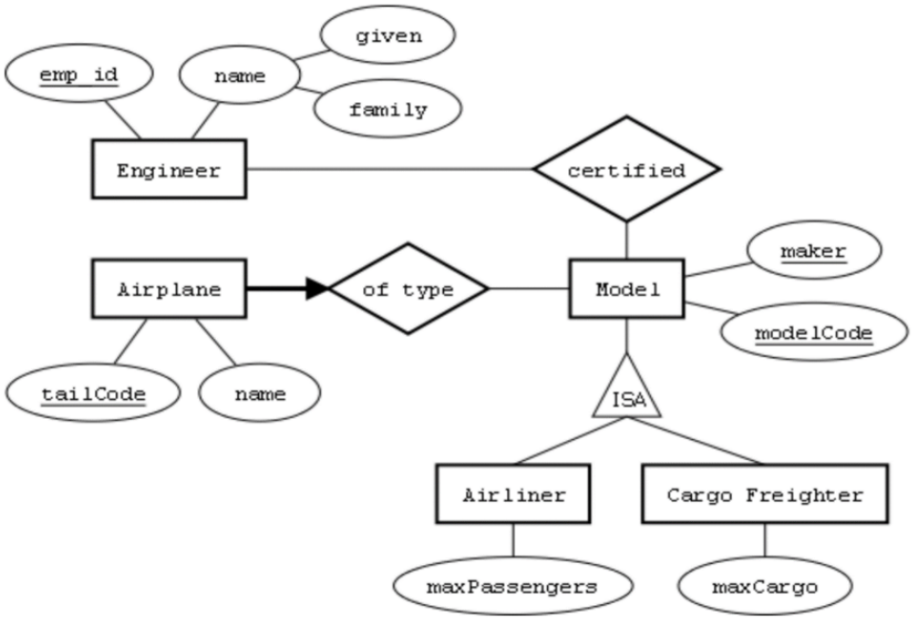
A(viii) [7 minutes] Consider the query

```
SELECT MemberID, Name
FROM Members
WHERE Joined < '2022-01-20' AND Role = 'Tester'
```

Write SQL to create an index that will allow much faster execution for the query above, when the database has a large amount of data in the table. Also, explain how the index would allow the query to be calculated.

B

This question is based on the following E-R diagram which describes the information kept on the aircraft based at an airport, including the engineers who are trained to maintain them.



B(i) [3 minutes] Explain the meaning of the connected group of ovals, labelled name, given, family

B(ii) [4 minutes] State whether the diagram allows for a situation where airplane with tailCode 'QXS213' named 'Spirit of Sydney' is of type '373' from maker Boeing, and also the airplane with tailcode 'VGY961' named 'HappyDays' is of type '373' from maker 'Airbus'. Explain the specific features of the diagram which either allows this, or prevents this situation?

B.(iii) [12 minutes] Write SQL CREATE TABLE statements to define a relational schema that would be able to capture the information about the domain, corresponding to the conceptual data model shown in the ER diagram. Where possible, you should include constraints that match those shown in the diagram.

C

Consider the relation DoctorsInfo(VisitID, VisitDate, PatientID, Age, City, PostCode, ProvidorNo, Specialty, Diagnosis)
In DoctorsInfo, a tuple (118, 'Jan 3', 318, 22, 'Sydney', 2000, 329, 'Cardio', 'Murmur') represents that the visit 118 occurred on 3 January, when Patient 318 (who is 22 years old and lives in the city of Sydney in postcode 2000); during this visit the patient was seen by the doctor with ProvidorNo 329 (whose speciality is Cardio), and the patient has been diagnosed as suffering from Murmur.
The functional dependencies for this relation are

PatientID ➔ Age, PostCode, City
PostCode ➔ City
ProvidorNo ➔ Specialty
VisitID ➔ VisitDate, PatientID

Here is an instance of this relation

VisitID	Visit Date	PatientID	Age	City	PostCode	Providor No	Speciality	Diagnosis
118	Jan 3	318	22	Sydney	2000	329	Cardio	Murmur
118	Jan 3	318	22	Sydney	2000	295	Lung	TB
129	Jul 2	452	17	Canberra	2600	329	Cardio	Angina
213	Jul 2	318	22	Sydney	2000	183	Lung	Pneumonia
234	Sep 2	591	17	Brisbane	4000	329	Cardio	Healthy

C(i)[4 minutes] If you insert the tuple (234, 'Sep 2', 591, 17, 'Brisbane', 4000, 183, 'ENT', 'Cough') into the instance above, this would contradict a functional dependency. State which dependency this would violate, and explain in English why this insertion violates the dependency.

C(ii) [4 minutes] Give the attribute closure (VisitID, ProvidorNo)+ Show the step-by-step working of the calculation.

C(iii) [4 minutes] Justify the statement that DoctorsInfo is not in BCNF.

C(iv) [8 minutes] Give a lossless-join decomposition of the DoctorsInfo relation into two relations. For each of the two decomposed relations, state the functional dependencies that hold for that relation, and state a primary key for that relation, and indicate whether or not that relation is in BCNF

C(v)) [3 minutes] Justify that the decomposition you give in C(iv) has the lossless-join property

C(vi) [3 minutes] indicate whether or not your decomposition has the dependency-preserving property, and justify your decision.

D [12 minutes]

Write an overview of the steps needed to create a web-page where the user can enter a value, and then the system displays a single row from a table, where the given user-input appears as the primary key. Your answer can be based on the technology you used in assignment3. In particular, be explicit about which files need to be written or changed, and which functions need to be written or changed. Your writing is intended to be read by someone who knows SQL and Python, but has not previously worked with the Flask framework.