

ISYS2120 Week 13 Lab

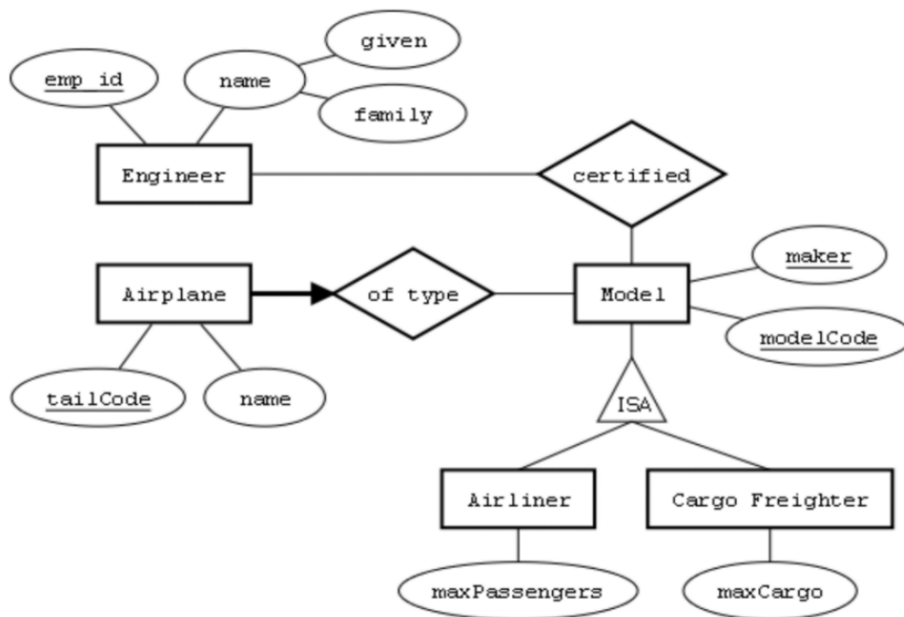
Revision Questions

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.

These questions have been made available as a Practice quiz in Canvas, so students can get experience in timing how long is reasonable for understanding the question, formulating an answer, and typing it in the textbox on Canvas. Please use this to ensure that in the exam itself, you don't run out of time before putting an answer for every question.

A

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.



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

A(ii) [6 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?

[A.(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.

B. The parts of this question refer to the following relational schema, which stores information about goods ordered and shipped for a warehouse.

```
CREATE TABLE Part (Pid INTEGER,
                    PName CHAR(20),
                    PDesc CHAR(30),
                    PRIMARY KEY (Pid));
CREATE TABLE Shipment (Sid INTEGER,
                        SDate DATE,
                        Cid INTEGER,
                        PRIMARY KEY (Sid),
                        FOREIGN KEY (Cid) REFERENCES Customer(Cid));
CREATE TABLE Contains (Pid INTEGER,
                        Sid INTEGER,
                        PRIMARY KEY (Pid, Sid),
                        FOREIGN KEY (Pid) REFERENCES Part(Pid),
                        FOREIGN KEY (Sid) REFERENCES SHIPMENT(Sid));
CREATE TABLE Order (Oid INTEGER,
                     ODate DATE,
                     PaidStatus CHAR(1),
                     Cid INTEGER,
                     Pid INTEGER,
                     PRIMARY KEY (Oid),
                     FOREIGN KEY (Cid) REFERENCES Customer(Cid),
                     FOREIGN KEY (Pid) REFERENCES Part(Pid));
CREATE TABLE Customer (Cid INTEGER,
                        CName CHAR(20),
                        CAddr CHAR(40),
                        PRIMARY KEY (Cid));
CREATE TABLE Cust_Phone (Cid INTEGER,
                          CPhone CHAR(15),
                          PRIMARY KEY (Cid, CPhone),
                          FOREIGN KEY (Cid) REFERENCES Customer(Cid));
```

B(i) [5 minutes] Write a SQL query to run against the schema above, that will find the SId and SDate of shipments that contain a part whose PName is 'WashingMachine'.

B(ii) [6 minutes] Write a SQL query to run against the schema above, that will produce a report showing the various Customers who have made orders, and for each CId, it gives the number of orders made by that customer.

B(iii) [6 minutes] Write one or more SQL queries to run against the schema above, that will find the SId of whichever shipment has the most recent SDate, among all shipments for customer 56 (if several shipments for this customer have equally recent SDate, the calculation should report on all of them)

B(iv) [6 minutes] Write one or more SQL statements that can be executed by the owner of the tables, in order to achieve the following security goals: User Kelly can access information about the SId and SDate of any shipment whose SDate is after January 1 2022; Kelly should not have access to information about other shipments; Kelly should not have access to the Cid column of the shipments data.

B(v) [5 minutes] Give an information request in English, whose answer is calculated by the following relational algebra expression:

$$\pi_{PName} (\sigma_{PaidStatus='Y'}(Order \bowtie Part))$$

C. This question's parts are based on the following information about the crew on airline flights. The crew members who will be on board a flight are recorded in an un-normalised relation with the following schema:

Crew(flightCode,destination,date,tailCode,acName,airline,emp_id,name,title)

For example, the row ('QF141', 'Dubai', '31-10-2019', 'VH-EAB', 'City of Canberra', 'Qantas', 65098, 'Joe Bloggs', 'Navigator') indicates that on 31st October 2019, flight QF141 departed for Dubai on Qantas aircraft VH-EAB ("City of Canberra") with navigator Joe Bloggs (employee ID 65098) on board. Note that *tailCode* is the government-issued registration number used to uniquely identify an aircraft.

You are told that the following functional dependencies apply in this table.

flightCode --> *destination*

flightCode, date --> *tailCode*

tailCode --> *acName, airline*

emp_id --> *name, title*

C(i) [2 minutes] Calculate the attribute closure *flightCode*⁺. Show your working.

C(ii) [2 minutes] Calculate the attribute closure (*flightCode, date*)⁺. Show your working.

C(iii) [6 minutes] State whether the relation *Crew* is in BCNF. Show your working.

C(iv) [6 minutes] Give a candidate key for the relation *Crew*. Justify your claim that this is a candidate key.

C(v) [8 minutes] Give a decomposition of the relation *Crew*, into two or more relations, with the properties that the decomposition is both lossless-join and

dependency- preserving. Explain how you know that the decomposition has these properties.

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.

After the lab: Complete Quiz 13, before the due date at the end of the week. We also recommend that you begin choosing material to put into a summary of essential content, which you will write out as the basis for notes on paper that you can consult during the exam.