For both questions, you are given the following relational schema.

Passengers(pid:integer, pname:string, age:integer, city:string)
Flights(fid:integer, from:string, to:string, miles:integer, aircraft:string)
Tickets(pid:integer, fid:integer, price:integer)

The database contains passenger and flight information for an airline in a single day. The description is as follows: passengers are uniquely identified by pid and they have as attributes name, age and city of residence. Flights are uniquely identified by fid. Each flight has an origin and destination airport identified by from and to respectively (airport codes are unique 3-letter strings, i.e., no two airports have the same code), flight distance given by miles, and aircraft type, e.g., B737, B777, A320, etc. The Tickets relation provides information on flights that passengers took, and also the price that was paid for the flight.

Question 1 (10 points)
Write relational algebra expressions for the following queries:

(a) Find the names of passengers who traveled on a B787 aircraft and paid at most $800 for that ticket.
(b) Find the ages of passengers who traveled only on flights going in or out of BOS (assumes that they were on at least one flight).
(c) Find the origin (i.e., from) of flights that had both passengers who reside in Boston and passengers who reside in Chicago.
(d) Find the ages of passengers that were on exactly one flight for the day.
(e) [630 only] Find the names of passengers who had connecting flights, defined as two flights where the origin of the second flight is the same as the destination of the first. Note that, return flights do not qualify as connecting flights (e.g., BOS to SFO and SFO to BOS is not a connecting flight, whereas BOS to JFK and JFK to LAX is a connecting flight).

Note: for this question, you are NOT ALLOWED to use SQL, answers in SQL will not receive any marks. Derive relational algebra expressions only.

Question 2 (20 points)
Write SQL queries for the following:

(a) Write a statement to create the table Tickets. You do NOT need to provide create table statements for the other tables. Include necessary key constraints.
(b) Find the ages of passengers who traveled only on B787 aircraft (assumes they were on at least one flight).
(c) Find the names of passengers who traveled on all aircraft types.
(d) Find for each flight with at least 100 passengers (of any age) the average price paid by passengers who are older than 30. List the fid in the output to identify the flight.
(e) List the amount of revenue earned by the airline for each aircraft type (include type in the output).
(f) Find the ages of passengers who were on three or more flights for the day.
(g) [630 only] Calculate the revenue earned by the airline from tickets on the flight(s) with the longest distance.
Q1 Answer:
Q2 Answer: