Assignment 5

EECS341 Spring 2019
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Due: Tuesday, April 23, 2019

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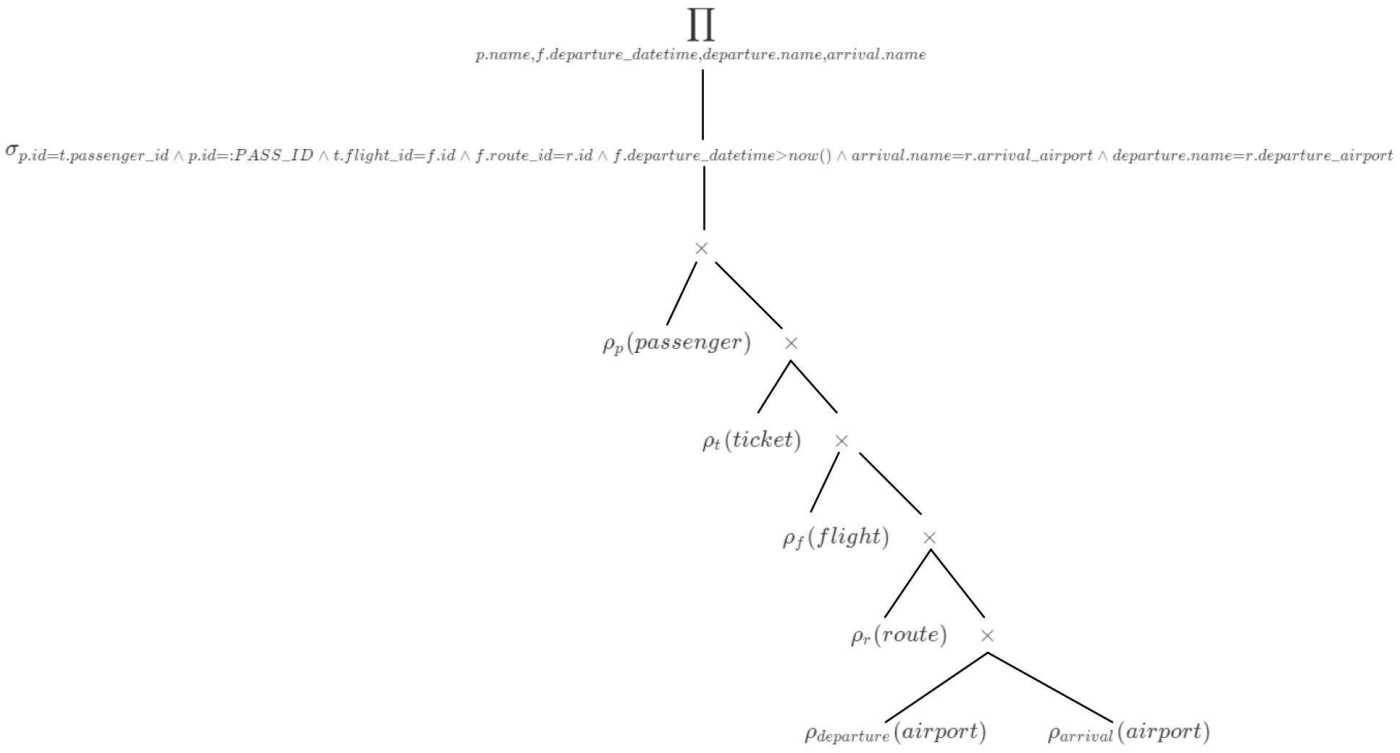
1. Write a naive (straightforward) expression of this query in relational algebra using only cross joins, and applying predicate selections after the joins.

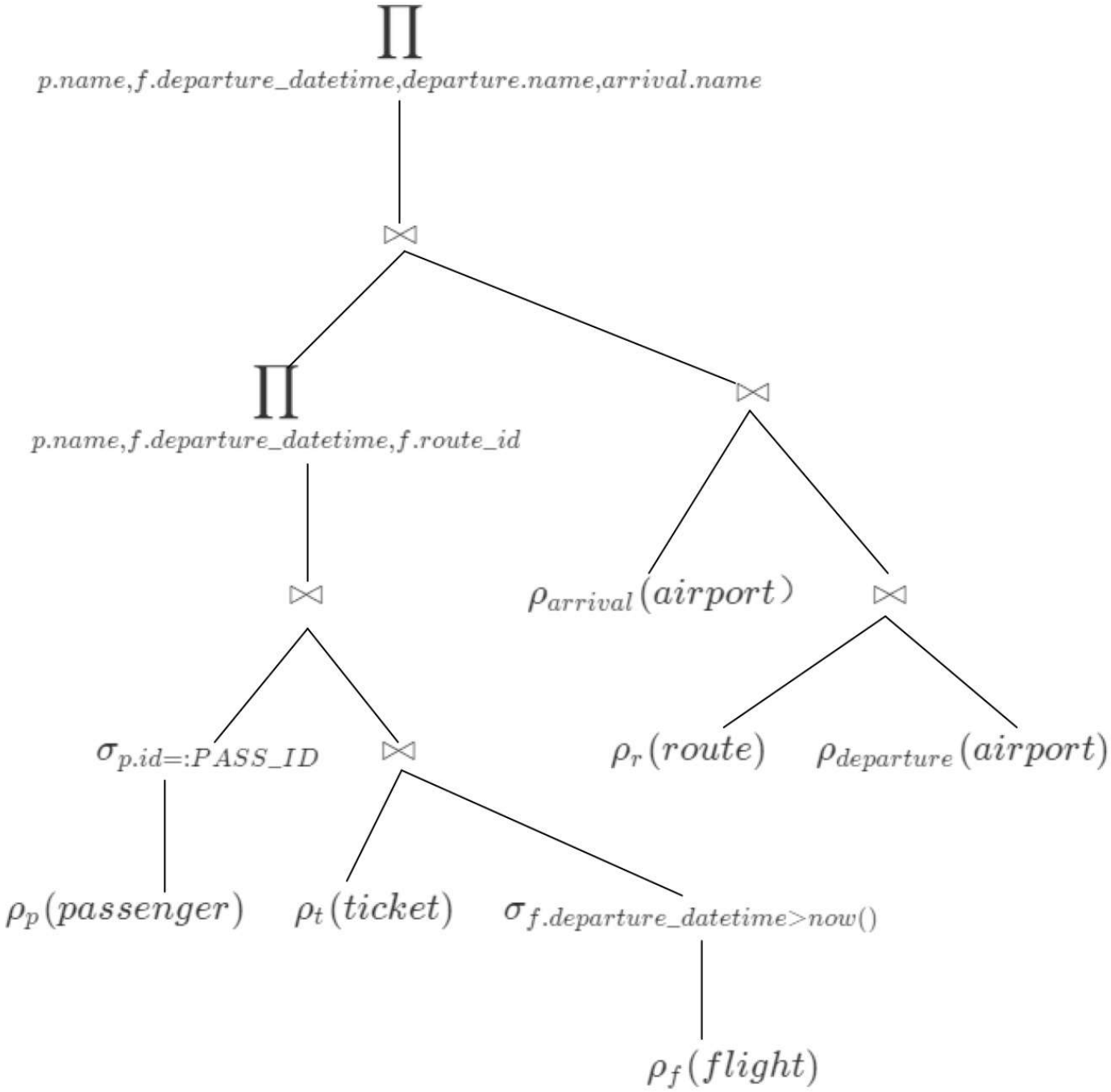
$$\prod_{p.name,f.departure\_datetime,departure.name,arrival.name} (\sigma_{p.id=t.passenger\_id \wedge p.id=:PASS\_ID \wedge t.flight\_id=f.id \wedge f.route\_id=r.id \wedge f.departure\_datetime>now() \wedge arrival.name=r.arrival\_airport \wedge departure.name=r.departure\_airport} (\rho_p(passenger) \times \rho_t(ticket) \times \rho_f(flight) \times \rho_r(route) \times \rho_{departure}(airport) \times \rho_{arrival}(airport)))$$

2. Convert the expression from (1) into a parse tree.



CORRECTION: *switch* $\rho_r(route)$ *with* $\rho_{departure}(airport)$, *so that* $\rho_r(route)$ *and* $\rho_{arrival}(airport)$ *would be in the same depth*

3. Apply equivalence rules and heuristic optimizations to create an optimized parse tree, for example, by using theta joins and pushing down selections and projections.



4. Suppose that on login we would like to show a passenger how many total flights they have completed and how many miles they have traveled. A materialized view could be used to precompute and cache this information so that information display on login is fast. Write a definition for a view that computes this information for a passenger.

```
CREATE MATERIALIZED VIEW flight_mileage AS (
    SELECT COUNT(DISTINCT flight.id), SUM(route.miles)
    FROM (
        SELECT passenger.id, COUNT(DISTINCT flight.id), SUM(route.miles)
        FROM passenger, ticket, flight, route
        WHERE passenger.id = ticket.passenger_id
          AND ticket.flight_id = flight.id
          AND flight.route_id = route.id
          AND flight.departure_datetime < now()
        GROUP BY passenger.id)
    WHERE passenger.id = :PASS_ID)
```