

# Lab Sheet 9: Optimization with DBMS

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## Lab Task

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You have been provided with a MySQL database containing information about trains on Indian Railways.

This database has three tables, "schedule", "stations" and "terminus" that are described in more detail below.

1. You have to write (a sequence of) SQL queries to construct a table listing all pairs of stations (A,B) where A and B are from the list of terminus stations specified in the table "terminus" such that one can go from A to B with at most two changes of train.

Your output should be a table of the form:

(StationA, StationB, Train1, Change1, Train2, Change2, Train3)

If there is a direct train, the columns from Change1 onwards will be empty.

If one change is required, Train1 is the train originating from StationA, Change1 is the station where one changes trains and Train2 is the second train that reaches Station B. Change2 and Train3 will be empty.

If two changes are required, Train1 is the train originating from StationA, Change1 is the station where one changes from Train1 to Train2, Change2 is the station where one changes from Train2 to Train3 and Train3 reaches StationB.

In this table, StationA, StationB, Change1 and Change2 should all be in terms of the abbreviated station codes while Train1, Train2 and Train3 will be in terms of the train numbers.

Needless to say, in any row of the table, no two stations and no two trains should be the same.

2. Repeat the above exercise with three changes.

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<sup>1</sup>Question taken from Databases course offered by Prof. Madhavan Mukund

## List of Tables

- **schedule:** This table describes each train, one stop at a time. A row in the table of the form

(N, S, T1, D1, T2, D2)

indicates that train N arrives at station S1 at time T1 on day D1 and leaves at time T2 on day D2.

For the originating station of a train, T1 and D1 will be blank, while for the final station, T2 and D2 will be blank.

Trains are identified by their number, stations by their station code. Since a train journey may last over multiple days, the arrival and departure times are accompanied by the "day number". Each train starts on day 0, so all stops on the first day have day number 0, stops on the second day have day number 1 etc.

For instance, if train 8888 originates from Chennai Central (MAS) at 2345 and next stops at Arakkonam (AJJ) at 0045 for 10 minutes, the corresponding entries in the table "schedule" will be

(8888,MAS,NULL,NULL,2345,0)

(8888,AJJ,0045,1,0055,1)

- **stations:** Lists out the station name for each station code.
- **terminus:** Subset of stations from the table "station".

## Submission Instructions

- Submit the queries in a text file written in correct sequence.