Task 1 (6 marks)
**Intuitive design of a data cube from a conceptual schema of an operational database**

A bus transportation company maintains an operational database, that contains information about the current locations of the busses owned by the company. A current location of a bus is determined by a trip segment a bus passes through, in a moment. A trip consists of a sequence of trip segments. A bus can traverse a trip in both directions. It is important to note, that the operational database contains only "point-in-time" information. Each time a bus moves to the next segment all information about its past locations (at the previous segments) is removed from a database. The remaining contents of an operational database is consistent with a conceptual schema given below.
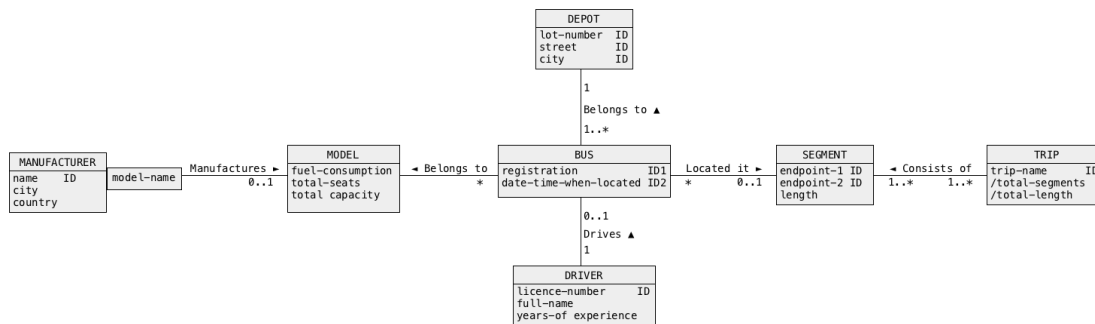
The company would like to implement a data warehouse that can be used to implement the following applications.

(i) *find the total number of kilometers travelled by each bus per year, per month per day.*

(ii) *find the total number of trips performed per bus, per driver, per year, per month, per day.*

(iii) *find the total number of drivers per trip.*

(iv) *find the total number travels per a trip segment, per trip, per bus, per year, per month per day.*

(v) *find an average duration of bus travel per trip segment, per trip, per year, per month per day.*

(vi) *find the total fuel consumption per trip segment, per trip, per bus model, per manufacturer, per year, per month, per day.*

(vii) *find the total number of trips per bus, per depot, per city*

(viii) *find the total number of passengers per segment, per trip, per year, per*

month per day.

(ix) find the largest number of passengers per bus, per trip,

(x)   find an average number of passengers per trip.

(1) Use a short explanation of a database domain and a conceptual schema given above, to find a data cube, that should be implemented by the bus company to create a data warehouse. In your specification of a data cube, list the facts, the measures, the names of dimensions and the hierarchies.

Facts

Trip segment passed

Measures

Trip segment length
Fuel consumed on a trip segment
Total number of passengers carried on a trip segment

Dimensions

Date-time of start of trip segment
Date-time of end of tripm segment
Bus
Driver
Trip

Hierarchies

Minute >- Hour >- Day >- Month >- Year
Bus >- Depot >- City
Bus >- Model >- Manufacturer
Trip-segment >- Trip

(2) Pick any three dimensions from a data cube found in the previous step and at least 4 values in each dimension and one measure to draw a sample three-dimensional data cube in a perspective view similar to a view included in a presentation 09 Data Warehouse Concepts, slide 6.

Fuel consumption

January 2020 — 2.5 litres
January 2020 — 2 litres
February 2020 — 2 litres — 3 litres
January 2020 — 2.5 litres

	Bus 1	Bus 2	Bus 3	Bus 4
Trip 1	3 litres	2.5 litres		3 litres
Trip 2		2 litres	2 litres	1.5 litre
Trip 3		4 litres		
Trip 4			5 litres	

1 litre
1.5 litre