

# M E T U

## DEPARTMENT OF COMPUTER ENGINEERING

CENG 302 - Introduction to Database Management Systems

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Consider the following relations containing bus company information:

Lines(lid: integer, departure:string, destination:string, distance:integer)

Bus(bid:integer, bname:string, capacity:integer)

Drivers(did:integer, dname:string, age:integer)

Schedule(sid:integer, lid:integer, did:integer ,bid:integer, departs:date)

The key fields are underlined, and the domain of each field is listed after the field name. Thus lid is the key for Lines, bid is the key for Bus, did is the key for Drivers and sid is the key for Schedule.

### Lines

lid	departure	destination	distance
L1	Istanbul	Ankara	450
L2	Istanbul	Izmir	560
L3	Ankara	Izmir	580
L4	Ankara	Kayseri	320
L5	Ankara	Bursa	380

### Bus

bid	bname	capacity
B1	M-401	45
B2	MAN	50
B3	M-404	45
B4	I-2	40

### Drivers

did	dname	age
D1	Ahmet	35
D2	Ali	55
D3	Hasan	38
D4	Huseyin	42

### Schedule

Sid	lid	bid	did	date
S1	L1	B1	D1	10.03.2009
S2	L2	B2	D4	10.03.2009
S3	L3	B3	D3	10.03.2009
S4	L4	B2	D1	13.03.2009
S5	L3	B1	D2	13.03.2009
S6	L5	B2	D1	15.03.2009
S7	L1	B2	D3	15.03.2009

- Code the following queries with relational algebra and show the resulting table for the given database instance.
  - List the bid and name of the bus with maximum capacity.
  - List the ids of Schedules that the driver name is 'Ahmet'.
  - List the pairs of Buses which are scheduled on the same line, together with the line number. If pair (a,b) is listed pair (b,a) should not be listed in the result.
  - List the names of drivers who have schedules on at least two days.
  - List the bids, drivers, destination and date of buses that depart from Ankara.
- State what the following relational algebra expression generates and show the resulting data that it produces using the database instance given above.

$\rho(S1, \text{Schedule}), \rho(S2, \text{Schedule})$

$\pi_{S1.sid, S2.sid} (\sigma_{(S1.bid=S2.bid) \wedge (S1.date \neq S2.date)} (S1 \times S2))$