

# EBU5503 Tutorial 1

# Relational algebra -- Exercise 1a

- The following tables form part of a database:
  - Employee (empNo, eName, salary, position)
  - Aircraft (aircraftNo, aName, aModel, flyingRange)
  - Flight (flightNo, aircraftNo, from, to, flightDistance, departTime, arriveTime)
  - Certified (empNo, aircraftNo)
- Where Employee contains details of all employees (pilots and non-pilots) and empNo is the key. Aircraft contains details of aircraft and aircraftNo is the key. Flight contains details of the flights and flightNo is the key. And Certified contains details of the staff who are certified to fly an aircraft, and empNo/aircraftNo form the key.

List details of all Boeing aircraft (Boeing is the aircraft name).

$\sigma_{aName="Boeing"}(Aircraft)$

# Relational algebra -- Exercise 1b

- Employee (empNo, eName, salary, position)
- Aircraft (aircraftNo, aName, aModel, flyingRange)
- Flight (flightNo, aircraftNo, from, to, flightDistance, departTime, arriveTime)
- Certified (empNo, aircraftNo)

List details of all Boeing 737 aircraft (737 is the model).

$\sigma_{aName="Boeing" \wedge aModel="737"}(\text{Aircraft})$

# Relational algebra -- Exercise 1c

- Employee (empNo, eName, salary, position)
- Aircraft (aircraftNo, aName, aModel, flyingRange)
- Flight (flightNo, aircraftNo, from, to, flightDistance, departTime, arriveTime)
- Certified (empNo, aircraftNo)

List employee number of all pilots certified to fly Boeing aircraft.

$$\Pi_{\text{empNo}}(\sigma_{\text{aName}=\text{"Boeing"}}(\text{Aircraft} \bowtie \text{Certified}))$$

# Relational algebra -- Exercise 1d

- Employee (empNo, eName, salary, position)
- Aircraft (aircraftNo, aName, aModel, flyingRange)
- Flight (flightNo, aircraftNo, from, to, flightDistance, departTime, arriveTime)
- Certified (empNo, aircraftNo)

List aircraftNo of aircrafts that fly from London to Sydney and can do so without stopping (flyingRange > flightDistance).

$$\Pi_{\text{aircraftNo}}(\sigma_{\text{from}=\text{"London"} \wedge \text{to}=\text{"Sydney"} \wedge \text{flyingRange} > \text{flightDistance}}(\text{Aircraft} \bowtie \text{Flight}))$$

# Relational algebra -- Exercise 1e

- Employee (empNo, eName, salary, position)
- Aircraft (aircraftNo, aName, aModel, flyingRange)
- Flight (flightNo, aircraftNo, from, to, flightDistance, departTime, arriveTime)
- Certified (empNo, aircraftNo)

List the cities where there are flights departing from, but no flights coming into.

Set operation: Set difference

$$\Pi_{\text{from}}(\text{Flight}) - \Pi_{\text{to}}(\text{Flight})$$

# Past exam question

- You are asked to design a relational database for a dental clinic, and the following information is given by the clinic:
  - There are a number of dentists working in the clinic, and the database needs to store their ID, name, qualification details.
  - There are a number of registered dental patients, and the database needs to store their patient ID (which uniquely identifies a patient), name, address, date of birth and some other personal information.
  - There are a number of dental treatments (e.g. filling, root canal treatment, dental implant etc). Each treatment has a treatment ID, name, required materials, procedure etc.
  - Patients can book appointments with dentists to receive treatments, and the database needs to store the date, time and duration of the appointment. Dentists can also record comments for the appointment, e.g. examination results, etc.
- Draw an *Entity-Relationship(ER) model* for the dental clinic database. Your ER diagram must include details of the entities, attributes and relationships and **label** them clearly. Clearly **state the assumptions** if you make any.

# What entities do we need (with attributes)?

PATIENT

\*p\_id

p\_name

DoB

address

TREATMENT

\*t\_id

t\_name

material

procedure

DENTIST

\*d\_id

d\_name

qualification



# What are the relationships?

