北京郵電大學

Queen Mary
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EBU5502 Sample exam paper

Question 1

a) List and explain 4 advantages of using a database system for storing information compared with storing information in a number of files on the computer.

	Do not write in this column
	8 marks

b) Explain, and give an example of each of the following terms:

i) Primary key

ii) Referential integrity

iii) Functional dependency

iv) Transitive dependency

	Do not write in this column
	8 marks

c) What are the different roles in database environment? List and explain three of the roles:

	Do not write in this column
	9 marks

Question 2

The following tables form part of a database held in a Relational Database Management System:

`Employee (empNo, eName, salary, position)`

`Aircraft (aircraftNo, aName, aModel, flyingRange)`

`Flight (flightNo, 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.

a) Formulate the following queries in relational algebra:

i) List the details of all Boeing aircraft.	Do not write in this column
ii) List all Boeing 737 aircraft.	
iii) List the employee numbers of pilots certified for Boeing aircraft.	
iv) List the names of pilots certified for Boeing aircraft.	

v) List the aircraft that can fly nonstop from London to New York (flyingRange > flightDistance).	
vi) List the employee numbers of pilots who are certified to fly all aircrafts that Hugh Jackman is certified to fly.	
	15 marks

b) Formulate the following queries using SQL:

i) List the details of all Boeing 737 aircraft.	**Do not write in this column**
ii) List the employee numbers of pilots certified for Boeing aircraft.	
iii) List the names of pilots certified for Boeing aircraft.	
iv) List total number of flights from each city, order by city names alphabetically.	
	10 marks

Question 3

a) A district government requires the design of a database system that can provide information on all schools in the district. The requirements collection and analysis phase of the database design process has provided the following data requirements for the schools database system.

Represent each of the following requirements with an ER diagram (if you make any assumptions for your ER diagram, please also state them in your answer):

i) Every school has many pupils and many teachers. Each pupil is assigned to one school and each teacher works for one school only.

ii) Each teacher teaches more than one subject but a subject may be taught by more than one teacher. The database should store the number of hours a teacher spent teaching a subject. Data held on each teacher includes his/her ID Number (ID), name (first and last), sex, and qualifications. The data held on each subject includes subject title and type.

iii) Each pupil can study more than one subject and a subject may be studied by more than one pupil. Data held on each pupil includes the pupil's code, name (first and last), sex, and date of birth.

iv) Each school is managed by one of its teachers. The database should keep track of the date he/she started managing the school. Data stored on each school includes the school's code, name, address (town, street, and post code) and phone.

	Do not write in this column
	25 marks

b) A relation R (A, B, C, D, E) has the following functional dependencies:

fd1: A → B

fd2: B, C → E

fd3: D, E → A

i) List all candidate keys for relation R.
ii) Is relation R in 3NF?
iii) Is relation R in Boyce–Codd Normal Form (BCNF)?

	Do not write in this column
	5 marks

Question 4

a) Explain the ACID properties of a transaction.

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	8 marks

b) Explain NoSQL and its key features. What are the advantages of using semi-structured data storage over traditional relational database?

	Do not write in this column
	12 marks