



RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree
First Year Semester I Examination – September/October 2013

COM 1302- DATABASE MANAGEMENT SYSTEMS

Time: Three Hours

Answer all questions.

1.
 - a. Describe three advantages of database approach over traditional file processing. [6 Marks]
 - b. Define three schema architecture. [3 Marks]
 - c. Explain physical and logical data independence [2 Marks]
 - d. What is the difference between candidate key and primary key for a given relation? What is a super key? Give example for each. [4 Marks]
 - e. Explain with examples:
 - i. one to many relationships
 - ii. multi valued attributes [2 Marks]
 - f. Briefly describe the main phases in Database design. [3 Marks]

2. Draw an ER/EER diagram for the scenario given below. State any assumption you made.

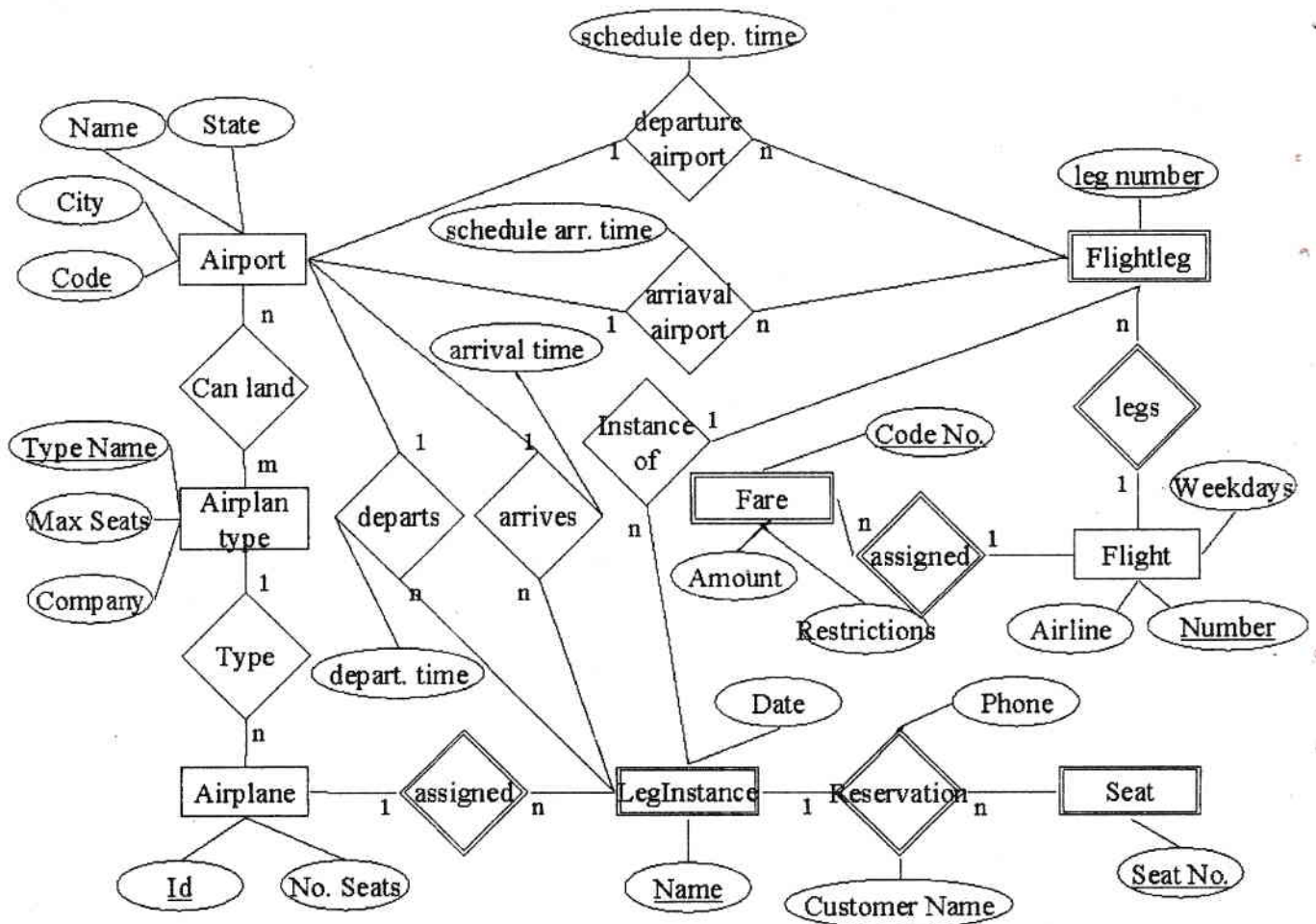
A college consists of number of departments which has *dept_code*, *dept_name*, budget and a phone. Each department can offer number of courses with each course offered by a single department. Every course has a unique *course_id*, *name* and *number_of_credits*. Each department has number of lecturers and one lecturer is attached to only one department. Each lecturer has an *empid*, *name*, *address*, *designation*, *contact_no* and *date joined*. One lecturer with the designation senior lecturer would be appointed as the department head.

Each course may be delivered by one lecturer and lecturer may deliver more than one course. Each course may serve as a pre-requisite of one or more courses as well as there may be one or more courses as its pre-requisites as well as there may be one or more courses as its pre-requisites. Each course consists of sections and each section has a *section_id* and a *title*. *Section_id* is able to identify a section with respect to a particular course only.

The students in the college are either diploma or higher diploma students and each student has a *student_registration_no*, *name*, *contact_no*, *address*, and *index number*. The difference between diploma and higher diploma students is that each diploma student has a *subject_stream* whilst each higher diploma student has a *project_title*. Each student should enroll for respective courses and the *grade* and the *mark* obtained by each student for each course should also be recorded.

[20 Marks]

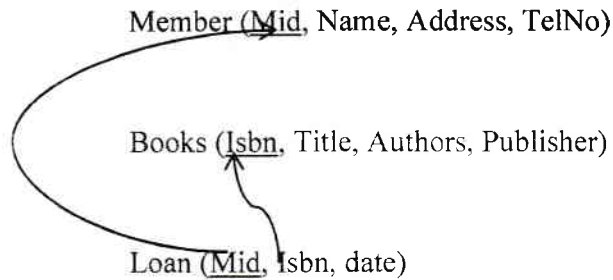
3. An ER-diagram for the airline reservation system is shown in the figure below.



- Map this ERD into a relational schema. Clearly specify the primary keys and the foreign keys in the resulting schema. [14 Marks]
- Write DDL statements to implement three relations of the above schema. [6 Marks]

4.

a. Consider the following relational schema of a library system.



Write following queries in relational algebra

- i. Find the names of members who have borrowed one or more books published by "Oxford Press" [2 Marks]
- ii. Find the average age of members. [2 Marks]
- iii. Find the names of members who have not borrowed books written by "Enid Blyton". [3 Marks]
- iv. Find the names of members who have borrowed all books published by "Oxford Press". [3 Marks]

a. Consider the following part of the schema with respect to a bank database.

Branch(BranchName, Code, City, Assets)

Account(AccNo, Balance, Acc-type, BranchName)

Loan(LoanNo, Amount, Loan-type, BranchName)

Depositor(CustomerNo, AcctNo)

Borrower(CustomerNo, LoanNo)

Write following queries in SQL.

- i. Create the table for Borrower enforcing the integrity and primary key constraints. [2Marks]
- ii. List the Customer numbers who have borrowed more than one loan. [2Marks]
- iii. Add 5% interest to account balances if the balance is greater than 50 000. [3Marks]
- iv. Find all customer numbers who have **Acc-type savings** but no **Loan-type housing** at the bank. [3 Marks]

5.

- a. Discuss insertion, deletion, and modification anomalies. Illustrate with examples. [6 Marks]
- b. An engineering consultancy firm supplies temporary specialized staff to bigger companies in the country to work on their project for certain period of time. The table below lists the time spent by each of the company's employees at other companies to carry out projects. The National Insurance Number (NIN) is unique for every member of staff.

NIN	Contract No	Hours	Employee Name	Company ID	Company Location
616681B	SC1025	72	P. White	SC115	Belfast
674315A	SC1025	48	R. Press	SC115	Belfast
323113B	SC1026	24	P. Smith	SC23	Bangor
616681B	SC1026	24	P. White	SC23	Bangor

- c. Explain in which normal form is this table? [2 Marks]
- d. Find the Primary Key for this relation and explain your choice. [3 Marks]
- e. Find the Fully Functional Dependencies on the PK and the Partial Dependencies on the PK. [3 Marks]
- f. Normalize the table to 2NF.
- g. Find the transitive dependencies on the 2NF tables. [3 Marks]
- h. Normalize the tables to 3NF. [3 Marks]