



STAMFORD COLLEGE

SCHOOL OF COMPUTER SCIENCES DIPLOMA IN INFORMATION TECHNOLOGY

STC203 : DATABASE ORGANISATION & DESIGN

Date : 17 November 2005 (Thursday)

Time : 9.00 a.m. – 11.00 a.m.

Duration: 2 hours

Instructions to Candidates

Answer ALL questions.

Please ensure that this examination paper contains FOUR questions on THREE printed pages before you start the examination.

Books, papers and other written materials are not allowed to be brought into the examination hall. A candidate who violates the examination rules of Stamford College or commits a malpractice will be disqualified from the examination.

Candidates may use calculators provided the calculators give no printout, have no work display facilities, are silent and cordless.

Write your Examination Index Number on each page of your answer booklet.

Candidates are required to attempt all the questions.

Question 1

(a) Describe what relationship types are represented in an ER model and provide examples of relationships with suitable diagrams.

- (i) Unary
- (ii) Binary
- (iii) Ternary

(10 Marks)

(b) Explain why the database systems approach was introduced to overcome the problems of file based systems?

(10 Marks)

(c) List the components of a computer-based information system.

(5 Marks)

(Total = 25 Marks)

Question 2

The Sunset Beach Dance Club (SBDC) at Miami is currently offering private and group lessons to teach the popular Macarena dance. SBDC charges \$35 per hour per student (or couple) for a private lesson and \$6 per hour per student for a group lesson. Private lessons are offered from noon until 10 p.m., six days a week. Group lessons are offered in the evenings only.

SBDC employs two types of instructors: full-time salaried instructors and part-time instructors. Full-time instructors are paid a fixed amount per week, and part-time instructors are paid either a set amount for an evening or a set amount for a particular class.

In addition to lessons, SBDC sponsors two weekly social dances featuring recorded music. The admission charge is \$3 per persons, but there are lots of goodies and giveaways during the socials. The Friday night dance is the most popular and averages around 80 people; the Saturday night dance attracts about 30 people. The purpose of the dance is to give students a place to practice their skills and try out innovative techniques. No food or drinks are served.

SBDC would like to develop a database system to keep track of their students and classes they have taken. SBDC's managers would also like to know how many and which types of lessons each instructor has taught and to compute the average cost per lesson for each of their instructors.

(a) Draw an ER/ERR diagram (using UML notation) for the above scenario. Show all entities and attributes together with the cardinality ratio and participation constraints of each relationship type.

(20 Marks)

(b) Describe the basic concepts of the entity-relationship model.

(5 Marks)

(Total = 25 Marks)

Question 3

Decompose the following relation as required for the whole schema to be in the 3rd Normal form.

STUDENTS

(StudentNo,
StudentName,
StudentAge,
ModuleNo
ModuleName
Lecturer No
LecturerName)

Show the detailed steps and explain your reasoning.

(Total = 25 Marks)

Question 4

(a) The following relations form part of a database of a web server:

PAGE (ID, Path, Owner, Last_Modified, Text)
REQUEST (No, IP, When, ID)
KEYWORD (Word, ID)

Formulate the following queries using SQL:

- (i) Print the ID number and path of all web pages that refer to both “Databases” and “WWW” (so they have at least these two entries in the “Keyword” table).
(5 Marks)
- (ii) Print the ID number and path of all web pages, which were not requested in 2005, example for which there is no request in the database on '01-JAN-2005' or later.
(5 Marks)
- (iii) How many distinct words does the KEYWORD table contain (print only the count)?
(3 Marks)
- (iv) For each web page (ID and Path), that was requested at least 10 times, print the number of requests. The output should be sorted by this number, with the most often requested page being listed first.
(6 Marks)

Question 4 (continued)

(b) Consider the following relation schemes:

COMPANY (Cno, Cname, Ccity)
PERSON (SSN, Name, Street, City, Bdate, Bcity)
WORKS (SSN, Cno, Salary)
MANAGES (SSN, Manager_SSN)

A number of companies, each with a unique company number (Company.cno), name (Company.cname) and the city that they are located in (Company.ccity), are listed in COMPANY table. PERSON table holds rows including information about people working in those companies: the social security number of the person (Person.ssn), the name of the person (Person.name), the address information (Person.street and Person.city), birthday (Person.bdate) and the city where the person was born in (Person.Bcity). A person works in a company for a certain salary and this information is held in WORKS table (Works.ssn, Works.cno, Works.salary). Employees with their managers are listed in MANAGES table (Manages.ssn, Manages.manager_ssn). Both managers and other employees are in PERSON table.

For each of the following queries, give the relational algebra expression

- (i) Find the name of all companies located in 'Cleveland'.
(2 Marks)
- (ii) Find the name and salary of all employees who work for 'Key Bank'.
(4 Marks)
- (Total = 25 Marks)

- END OF PAPER -

