

UNIVERSITI SAINS MALAYSIA

Second Semester Examination  
Academic Session 1998/99

February 1999

**CSI512 - Data Base Management Systems**

Duration : [3 hours]

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**INSTRUCTION TO CANDIDATE:**

- Please ensure that this examination paper contains **FOUR** questions in **FIVE** printed pages before you start the examination.
  - Answer **ALL** questions.
  - You can choose to answer either in Bahasa Malaysia or English.
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ENGLISH VERSION OF THE QUESTION PAPER

1. (a) List 4 limitations of file-processing systems. (4/25)
- (b) Consider the statement "A database is a model of the users' model of reality". How does it differ from "A database is a model of reality"? (6/25)
- (c) Explain the difference between the following terms. Give an example of each.
- (i) Entity and attribute.
- (ii) HAS-A relationship and IS-A relationship. (6/25)
- (d) How does software product SALSA help to generate a database? (3/25)
- (e) What are the 3 principle means by which users control application? Summarize the advantages and disadvantages of each. (6/25)
2. (a) Draw either an E-R diagram or a semantic object diagram which represents the relationships among colleges, departments, professors and students.
- The university consists of several colleges, each with several departments. Each department must belong to a single college. Each department maintains a staff of professors. There are no joint appointments, and there are no professors without appointment. That is, a professor teaches within exactly one department. Students major in the various departments, and a student can major simultaneously in more than one department. Indeed, a student need not have a major. The relationship between department and student carries the attribute regdate, giving the date the student established a major in the department. The entities college, department, professor, and student have key fields cno, dno, pno, and sno respectively. Each is further described with a name attribute (e.g., cname, dname). (10/25)
- (b) Convert above diagram to a relational model. Specify all primary keys. (7/25)
- (c) Write the following queries in relational algebra for the above relational scheme designed in (b).
- (i) Retrieve the professors that teaches in mathematic department.
- (ii) List the names of all students associated with major in computing and mathematic.

- (iii) List the names of all departments which are under the College of Science.
- (iv) List all the students who registered on March 12, 1998.

(8/25)

3. Consider the following universal relation that holds information about toys in a toystore:

Toys (ToyName, Code, Designer, Producer, ProducesAdd, TotalOrder, TotalInStock, DateProduce, Category, SellingPrice, Cost)

Assume that:

- The Code identifies a toy uniquely.
- If a toy has more than one Designer, only the first is listed.
- A Designer may produce more than one toy.
- Each Producer name is unique. Each Producer has one unique address, the address of the firm's headquarters.
- ToyName are not unique.
- TotalOrder is the number of order of a particular toy that the toystore has ever ordered, while TotalInStock is the number still unsold in the toystore.
- Each toy has only one production date. A duplicate of a toy is given a new Code.
- The category may be educational, action figures and so on. The ToyName alone is not sufficient to determine the category.
- The SellingPrice, which is the amount the toystore charges for a toy, is always 20 percent above the Cost, which is the amount the toystore pays the Producer.

(a) Identify the candidate and primary key for this relation.

(2/25)

(b) In what normal form is toys?

(4/25)

(c) Find all the valid functional dependency in this relation.

(4/25)

(d) Describe two modification anomalies from which toys suffers.

(4/25)

(e) Does this relation contain a transitive dependency?

(2/25)

- (f) Normalize this relation to eliminate the problems with toys.

(4/25)

- (g) Discuss the purpose of normalization. When would it make sense not to normalize certain relations?

(5/25)

4. (a) The questions refer to the following three relations:

SALESPERSON (Name, Age, Salary)

ORDER (Number, CustName, SalespersonName, Amount)

CUSTOMER (Name, City, IndustryType)

Name	Age	Salary
Abel	63	120,000
Baker	38	42,000
Jones	26	36,000
Murphy	42	50,000
Zenith	59	118,000
Kobad	27	34,000

SALESPERSON

Number	CustName	SalespersonName	Amount
100	Abernathy Construction	Zenith	560
200	Abernathy Construction	Jones	1800
300	Manchester Lumber	Abel	480
400	Amalgamated Housing	Abel	2500
500	Abernathy Construction	Murphy	6000
600	Tri-City Builders	Abel	700
700	Manchester Lumber	Jones	150

ORDER

Name	City	IndustryType
Abernathy Construction	Willow	B
Manchester Lumber	Manchester	F
Tri-City Builders	Memphis	B
Amalgamated Housing	Memphis	B

CUSTOMER

Figure A

An instance of these relations is shown in Figure A. Use the data in those tables and show the SQL statements to display or modify data as indicated in the following questions:

- (i) Show the ages and salaries of all salespeople but omit duplicates.
- (ii) Show the names and salary of all salespeople who do not have an order with Abernathy Construction, in ascending order of salary.
- (iii) Compute the average age of a salesperson.
- (iv) Show an SQL statement to insert rows into a new table, HIGH-ACHIEVER (Name, Age), in which, to be included, a salesperson must have a salary of at least 100,000.
- (v) Show an SQL statement to change the salary of salesperson JONES TO 45,000.
- (vi) Show the names and ages of salespeople who have two or more orders.

(12/25)

- (b) Explain how the processing of the following SQL query would differ in a client-server system and in a file-sharing system.

```
SELECT      StudentName, ClassName
FROM        STUDENT, GRADE
WHERE      STUDENT.StudentNumber = GRADE.StudentNumber
AND        GRADE.Grade = 'A'
```

Assume that the database contains two tables:

STUDENT (StudentNumber, StudentName, StudentPhone)  
 GRADE (ClassNumber, StudentNumber, Grade)

Also assume that the primary and foreign keys have indexes.

(5/25)

- (c) What are the two ways that queries can be created in Access? Which do you think is better? Why?

(3/25)

- (d) Given the following two relations:

COMPANY (Name, NumberEmployees, Sales)  
 MANUFACTURERS (Name, PeopleCount, Revenue)

- (i) Give an example of a union of these two relations.
- (ii) Give an example of a difference of these two relations.
- (iii) Give an example of an intersection of these two relations.

(5/25)