

UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 1997/98

February 1998

CSI512 - Database Management Systems

Duration : [3 hours]

INSTRUCTION TO CANDIDATE:

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

1. (a) Draw an E-R diagram which represents the following domain of criminal court cases:

Each judge has a list of outstanding cases over which he will preside. Only one judge presides per case. For each case one prosecuting counsel is appointed to present the Department of Public Prosecutions. Cases are scheduled at one Crown Court for an estimated duration from a given start date. A case can try more than one crime (ex. robbery, murder, etc.) Each crime can have one or more defendants. Each defendant can have one or more counsel defending. Defendants may have more than one outstanding case against them.

(10 marks)

- (b) Convert above -E-R diagram to a relational model. Specify all primary keys.

(6 marks)

- (c) Write the following queries in relational algebra for the above relational scheme designed in (b).

- (i) Retrieve the cases handled by "Mr. JUDGE".
 (ii) List the names of all crimes associated with case number 10.
 (iii) List the names of all judges who handled only 'murder' cases.
 (iv) List all the cases who are scheduled on August 30,1996.

(8 marks)

- (d) Write the queries given in (c) in SQL.

(10 marks)

2. Consider a database with three relations storing information about pilots and air-planes. Certified (pilot, type), active (pilot, duty), planes (pno., type status). An example database is shown below.

Certified	Pilot	Type	Active	Pilot	Duty	Planes	No.	Type	Status
	Abe	707		Abe	on		101	707	ready
	Abe	727		Dee	off		102	727	hold
	Abe	747		Fil	on		103	727	ready
	Dee	727		Itap	on		104	737	maintenance
	Dee	747					105	747	ready
	Fil	707					106	1101	order
	Fil	727							
	Fil	747							
	Fil	1101							
	Itap	727							

- (a) Write the answers for the following queries from the database given:

- (i) Find all available pilots who can fly the plane 105.
 (ii) Find all pilots who are capable to fly all air-planes that are available.

(5 marks)

- (b) Express the queries in (a) in relational algebra. (5 marks)
- (c) Express the queries in (a) in SQL. (5 marks)
- (d) What is the output of the following query?

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Select pilot
from certified,planes
where status = "ready" and certified.type = planes.type
group by pilot
having count (unique pno.) >= all
(select count (unique pno.) from certified , planes
where status = "ready" and certified.type = planes.type
group by pilot)

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(3 marks)

3. Consider the following relation:

project (project-id, employee-name, salary)

Each employee can work on more than one project. one project can have many employees. All the Employees draw different salary.

Answer the following:

- (a) What is the primary key of the above relation? (2 marks)
- (b) In what normal form is project? Show. (3 marks)
- (c) Find all the valid functional dependency in the project relation. (4 marks)
- (d) Describe two anomalies from which project suffers. (4 marks)
- (e) Redesign this relation to eliminate the problems with project. (4 marks)

4. Consider the following relation.

Project-hours (Emp-name, project-id, task-id, phone, total hours)

An employee can work on more than one project and one project has many employees. Each employee has a phone. Task-id is related to different tasks within a project. Total hours is the number of hours an employee work on each task within a project.

- (a) What is the primary key? (2 marks)
- (b) Does this relation contains transitive dependency? If yes, show. (3 marks)
- (c) Does this relation contains the multivalued dependency? If yes, show. (3 marks)
- (d) Describe the deletion anomaly that this relation contains. (3 marks)
- (e) Redesign this relation to eliminate the problem. (3 marks)
5. Consider the following three transactions:

T1 : Begin
 read(y)
 y = y+1
 write y
 commit T1

T2 : Begin
 read(x)
 read(y)
 y = y+1
 write y
 commit T2

T3 : Begin
 read(x)
 x=x+1
 write (x)
 commit T3

- (a) Show a concurrent execution of T1,T2,T3 that produces a non-serializable schedule. (4 marks)
- (b) Show a concurrent execution of T1,T2,T3 that produces a serializable schedule. (6 marks)
- (c) Use lock and un-lock instructions so that T1,T2,T3 follow the two-phase locking instructions. (7 marks)