Final Examination
Semester 3 / Year 2007

COURSE : DATABASE SYSTEM DESIGN
COURSE CODE : CSIS2023
TIME : 2 1/2 HOURS
DEPARTMENT : COMPUTER SCIENCE
CLASS : IT07-AB + CS07-AB
LECTURER : SO YONG QUAY

Student’s ID:
Batch No:

Notes to candidates:
1) The question paper consists of 3 pages and 6 questions.
2) Return the question paper with your answer booklet.
3) There are two sections in this paper. Students are required to answer both sections.
   a) Section A: Answer any 2 out of 3 questions.
   b) Section B: Answer any 2 out of 3 questions.
Section A: Answer any 2 out of 3 Questions.

1. (a) There are three main approaches to managing the requirements for a database application that has multiple user views, namely the **centralized** approach, the **view integration** approach, and a combination of both approaches. Please explain the **centralized** approach and **view integration** approach. (10%)

(b) Compare and contrast the three phases of database design. (15%)

2. (a) Explain what is meant by a transaction. Why are transactions important units of operation in a DBMS? (9%)

(b) Give any two mechanisms for concurrency control that can be used to ensure the types of problems (Lost update problem, the uncommitted dependency problem, and the inconsistent analysis problem) cannot occur. (10%)

(c) Discuss how the log file is a fundamental feature in any recovery mechanism. How do checkpoints affect the recovery protocol? (6%)

3. (a) Discuss the extended capabilities or services that a DDBMS must provide over a centralized DBMS. (12%)

(b) What is the difference between a homogeneous and heterogeneous DDBMS? Under what circumstances would such systems generally arise? (13%)
Section B: Answer any 2 out of 3 Questions.

4. Represent each of the following requirements with an ER diagram: (25%)

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

(a) Every school has many pupils and many teachers. Each pupil is assigned to one school and each teacher work for one school only.
(b) 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 national Insurance Number (NIN) name (first and last), sex, and qualifications. The data held on each subject includes subject title and type.
(c) 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.
(d) 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.

5. (a) Explain the purpose of data normalization and describe the main steps in the normalization process. (8%)

(b) The table shown below displays the details of the roles played by actors/actresses in films. Describe and illustrate the process of normalization by converting the table shown in table to Boyce–Codd Normal Form (BCNF). Identify the primary and foreign keys in your BCNF relations. (17%)

<table>
<thead>
<tr>
<th>filmNo</th>
<th>fTitle</th>
<th>dirNo</th>
<th>director</th>
<th>actorNo</th>
<th>aName</th>
<th>role</th>
<th>timeOnScreen</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1100</td>
<td>Happy Days</td>
<td>D101</td>
<td>Jim Alan</td>
<td>A1020</td>
<td>Sheila Toner</td>
<td>Jean Simson</td>
<td>15.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D101</td>
<td>Jim Alan</td>
<td>A1222</td>
<td>Peter Watt</td>
<td>Tom Kinder</td>
<td>25.38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D101</td>
<td>Jim Alan</td>
<td>A1020</td>
<td>Sheila Toner</td>
<td>Silvia Simpson</td>
<td>22.56</td>
</tr>
<tr>
<td>F1109</td>
<td>Snake Bite</td>
<td>D076</td>
<td>Sue Ramsay</td>
<td>A1567</td>
<td>Steven McDonald</td>
<td>Tim Rosey</td>
<td>19.56</td>
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<tr>
<td></td>
<td></td>
<td>D076</td>
<td>Sue Ramsay</td>
<td>A1222</td>
<td>Peter Watt</td>
<td>Archie Bold</td>
<td>10.44</td>
</tr>
</tbody>
</table>
6. Present a relational schema for the EER diagram shown below. (25%)