IN COLLABORATION WITH IVTB

Diploma in Information Technology
Cohort DIP/03/Full Time
Examinations for 2003 – 2004 / Semester 1

MODULE: DATABASE MANAGEMENT SYSTEM
MODULE CODE: BISE030
Duration: 2 ½ Hours

Instructions to Candidates:

1. Answer any four questions.
2. Always start a new question on a fresh page.
3. All questions carry equal marks.
4. Total marks 100.

This question paper contains 5 questions and 8 pages.
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ANSWER ANY FOUR QUESTIONS

QUESTION 1: (25 MARKS)

Briefly describe five advantages of using DBMS.

a) Compare and contrast between Hierarchical, Network and Relational database model.

b) Briefly describe the importance of logical data independence in ANSI/SPARC architecture. Explain the difference between the logical and physical data independence.

c) Define the following terms with appropriate examples

(i) DML
(ii) DDL
(iii) DCL

[3 marks]

d) The term integrity refers to the accuracy or correctness of the data in the database. Define the following terms

(i) Domain Integrity
(ii) Entity Integrity
(iii) Referential Integrity.

[6 marks]
QUESTION 2 : (25 MARKS)

a) Explain the following terms:

(i) Candidate Key
(ii) Composite Key
(iii) Derived attributes
(iv) Weak entity type
(v) Cardinality constraint

b) Draw an ER diagram for the following scenario.

Scenario:

Sam is the IT manager for a regional chain of restaurants. He has been asked to create a database system to keep track of food item inventory. One of the problems that he is encountering is that certain food items consist of different quantity of food items i.e. an item may consist of other items as shown below:

```
    Burger
    /   \
  Patty  Bun  Special source
    /     \
Mayonnaise  Relish  Spice mix
    /     \
Salt  Pepper
```

Sam sees certain advantages to treating all items uniformly. The identifier for an item is ItemID. Items are of two types – Retail items and Stock items. Retail item has price and description attributes and it appears on the menu. A Stock item has a cost and description attributes and it is ordered from a suppliers.

(Continued on next page)
QUESTION 2 (CONTINUED)

There are a number of critical pieces of information that the system must be able to store and recall:

**Menus:** There are different menus for different times of day. Each retail item may appear on multiple menus and each menu typically consists of multiple items. The identifier for a Menu is MenuID and another attribute is MenuDesc.

**Supplier:** A supplier may supply any number of stocks. Each stock item is supplied by a single supplier. The identifier for a supplier is SupplierID and another attribute is SupplierName.

c) Develop a relational schema for the E-R diagram produced in part (c).
QUESTION 3 : (25 MARKS)

a) Consider the following relations to answer the questions given below:

Students(sid: integer, sname: string, country: string)
Courses(cid: integer, cname: string, type: string, lecturerName: string)
Results(sid: integer, cid: integer, score: integer)

All the key fields are underlined. The type field specifies the course type, e.g. CS, IS, IT, MATH, EE, etc.

Write the following queries in SQL statements.

i. Find the names of all students coming from England. [2 marks]

ii. Using the IN clause, find the name of lecturers who teach one of the following courses: IT, IS, CS [2 marks]

iii. Find the name of students taking IT course [3 marks]

iv. Find the highest score obtained in CS [3 marks]

v. Create the table “Results” [3 marks]

b) Examine the following tables:

<table>
<thead>
<tr>
<th>Student</th>
<th>enrolled</th>
<th>subject</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>id</td>
<td>name</td>
</tr>
<tr>
<td></td>
<td>1234</td>
<td>james</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>hector</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>ling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Continued on next page)
QUESTION 3 (CONTINUED)

Attempt the following in relational algebra:

Formulate the given table in relation algebra:

<table>
<thead>
<tr>
<th></th>
<th>Id</th>
<th>name</th>
<th>code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1234</td>
<td>james</td>
<td>ma3000</td>
</tr>
<tr>
<td>2</td>
<td>1234</td>
<td>jame</td>
<td>cp2001</td>
</tr>
</tbody>
</table>

ii. Formulate two possible ways to get the following resultant table

<table>
<thead>
<tr>
<th>Code</th>
<th>lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>cp3010</td>
<td>Bill</td>
</tr>
<tr>
<td>cp1500</td>
<td>Bill</td>
</tr>
</tbody>
</table>

iii. Display the names of students taking a subject taught by Bruce.

iv. Display the names of students who are not enrolled for 'ma 3000'.

v. Draw the resulting relation from the given relational algebra?

Restrict student where name = "hector" giving T1
T1 Product enrolledIn giving T2.
QUESTION 4 : (25 MARKS)

The table below lists customer/car-hire data. Each customer may hire cars from various outlets. A car is registered at a particular outlet and can be hired out to a customer on a given date.

a) The data in the table below is subject to *update anomalies*. Provide examples of how *insertion*, *deletion*, and *modification* anomalies could occur on this table.

[3 marks]

b) Identify the *functional dependencies* represented by the data in the table. State any assumptions you make about the data.

[3 marks]

c) Using the functional dependencies identified, describe and illustrate the process of *normalization* by converting the table to Third Normal Form (3NF) relations.

[12 marks]

d) Draw an *Entity-Relationship model* for the data in the table. Show all the entities, relationships, and attributes.

[7 marks]

<table>
<thead>
<tr>
<th>CarReg</th>
<th>Make</th>
<th>Model</th>
<th>CustNo</th>
<th>CustName</th>
<th>HireDate</th>
<th>OutletNo</th>
<th>OutletLoc</th>
</tr>
</thead>
<tbody>
<tr>
<td>W565CDC</td>
<td>Ford</td>
<td>Escort</td>
<td>C100</td>
<td>Smith J.</td>
<td>14/05/03</td>
<td>21</td>
<td>Woodstock</td>
</tr>
<tr>
<td>W565CDC</td>
<td>Ford</td>
<td>Escort</td>
<td>C222</td>
<td>Patel V.</td>
<td>15/05/03</td>
<td>21</td>
<td>Woodstock</td>
</tr>
<tr>
<td>V734HSB</td>
<td>Nissan</td>
<td>Sunny</td>
<td>C100</td>
<td>Smith J.</td>
<td>14/05/03</td>
<td>21</td>
<td>Woodstock</td>
</tr>
<tr>
<td>W104RSM</td>
<td>Ford</td>
<td>Escort</td>
<td>C303</td>
<td>Brown F.</td>
<td>14/05/03</td>
<td>24</td>
<td>Denham</td>
</tr>
<tr>
<td>W104RSM</td>
<td>Ford</td>
<td>Escort</td>
<td>C100</td>
<td>Smith J.</td>
<td>16/05/03</td>
<td>24</td>
<td>Denham</td>
</tr>
<tr>
<td>W611SBH</td>
<td>Nissan</td>
<td>Sunny</td>
<td>C222</td>
<td>Patel V.</td>
<td>15/05/03</td>
<td>24</td>
<td>Denham</td>
</tr>
</tbody>
</table>
QUESTION 5 : (25 MARKS)

a) Define the term denormalization. Briefly explain the advantages and disadvantages of partitioning. [5 marks]

b) Write a short note on Hashed File Organisation. [4 marks]

c) Describe the advantages and disadvantages of database servers. [5 marks]

d) Distinguish between the 2-tier and the 3-tier client server architecture. [5 marks]

e) Briefly describe any three categories of middleware. [6 marks]

***END OF QUESTION PAPER***