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The Open University of Sri Lanka  
B. Sc. Degree Programme – Level 05  
Final Examination 2008/2009  
CSU 3278: Database Management Systems – Paper I  
Duration : Two and half hours

Date: 26.06.2009

Time: 10.00am – 12.30pm

Answer **Four** Questions **Only**.

1.

i. Match the following terms to the appropriate definitions.

third normal form

referential integrity

functional dependency

transitive dependency

- a. named two-dimensional table of data
- b. state of a relation that does not have transitive dependencies.
- c. functional dependency between two(or more) non-key attributes in a relation.
- d. process of merging relations developed from a conceptual data model with those from different user views.
- e. particular relationship between two attributes.
- f. name used for several different attributes.
- g. requirement that the value of an attribute come from the domain of another attribute

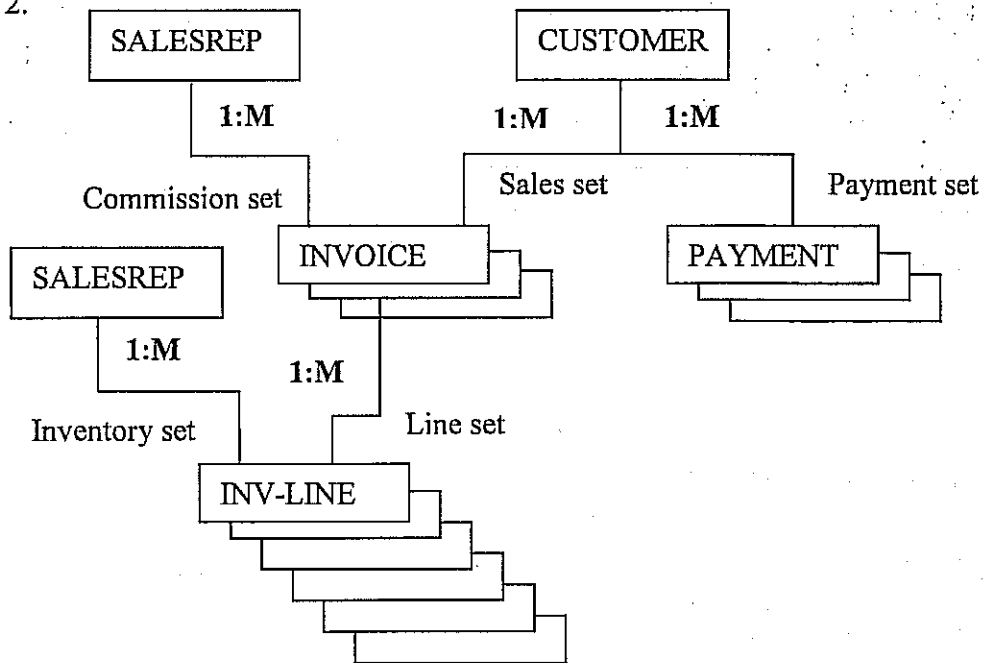
ii. What do you need to know about information systems to do logical data modeling?

iii. Compare DBMS approach with conventional file processing approach when used in data processing.

iv. What is data independence? Why data independence is important?

v. What is the difference between controlled redundancy and uncontrolled redundancy? Illustrate with an example.

2.



- i. Convert the network database model above into a design for a relational database model, using an ERD, Show all entities, relationships, and connectivities.
- ii. Using the ERD from part i) create the relational schema. Create an appropriate collection of attributes for each of the entities. Make sure you use the appropriate naming conventions to name the attributes.

3.

Suppose that as the database administrator (DBA) in a **hotel**, you have to setup a database, capturing all the information that the hotel needs to maintain.

- The hotel offers three types of **rooms**, including single room, duple room or triple room. Every room is identified by its unique number.
- The hotel has three types of **employees** such as the receptionists, the cleaning staff and the kitchen staff. Each **receptionist** is identified with her/his name and employee number and years of experience. Receptionists are also responsible for ensuring the room is clean before the room is assigned to the guest. Thus, they assign a single **cleaning staff** to clean each room every morning and/or when it is required. For each cleaning assignment, the date and the status need to be provided. The **kitchen staff** is characterized by their specific responsibilities, e.g. cook or waiter. The cleaning staff and the kitchen staff are also uniquely identified by their employee number.
- Receptionists welcome **guests** and upon presentation of their valid traveling documents, they allocate a unique room to each guest. Guests

are uniquely identified with their passport number but they must provide other necessary information including their name, phone numbers, the arrival date, the departure date, and their credit card information, including its type, number, and expiration date.

- A guest can be accompanied with one person to have a double room or at most two people for a triple room. Each **accompany** person is identified by his/her name.

Considering the descriptions given above, draw an **ER diagram** for the database, including entities, attributes, and relationships. Please pay attention to clear identification of different kinds of attributes (e.g. composite, multi-valued, derived, and primary key) and the mapping cardinalities and the total participation for the relationship sets.

4.

Temporary Employment Corporation (TEC) places temporary workers in companies during peak periods, TEC's manager gives you the following description of the business.

- TEC has a file of candidates who are willing to work.
- If the candidate has worked before, that candidate has a specific job history, (Naturally, no job history exists if the candidate has never worked.)
- Each candidate has several qualifications.
- TEC also has a list of companies that request temporaries.
- Each time a company requests a temporary employee, TEC makes an entry in the Openings folder. This folder contains an opening number, company code, required qualifications, starting date, anticipated ending date, and hourly pay.
- Each opening requires only one specific or main qualification.
- When a candidate matches the qualification, (s)he is given the job, and an entry is made in the Placement Record folder. This folder contains an opening number, candidate number, total hours worked, and so on. In addition, an entry is made in the job history for the candidate.
- TEC uses special codes to describe a candidate's qualifications for an opening. The list of codes includes:

<u>Code</u>	<u>Description</u>
SEC-45	Secretarial work, at least 45 words per minute
SEC-60	Secretarial work, at least 60 words per minute
CLERK	General clerking work
PRG-VB	Programmer, Visual Basic
PRG-C	Programmer, O+
DBA-ORA	Database Administrator, Oracle
DBA-DB2	Database Administrator, DB2
SYS-1	Systems Analyst, level 1
SYS-2	Systems Analyst, level 2
NW-NOV	Network administrator, Novell experience

TEC's management wants to keep track of the following entities:

COMPANY

OPENING

QUALIFICATION

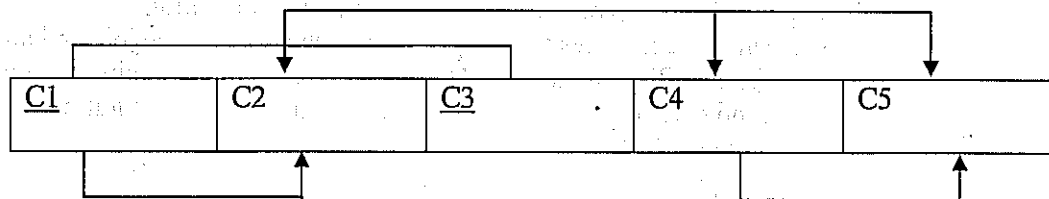
CANDIDATE

JOB\_HISTORY

PLACEMENT

Given this information, do the following:

- i. Draw the E-R diagram for this enterprise.
  - ii. Identify all possible relationships.
  - iii. Identify the connectivity for each relationship.
  - iv. Identify the mandatory/optional dependencies for the relationships.
  - v. Resolve all M:N relationships.
- 5.
- i. What is the purpose of normalization?
  - ii.



Given the dependency diagram shown above, answer Questions below.

- a. Identify and discuss each of the indicated dependencies.
- b. Create a database whose tables are at least in 2NF, showing the dependency diagrams for each table.
- c. Create a database whose tables are at least in 3NF, showing the dependency diagrams for each table

iii.

- a. What is a partial dependency? With what normal form is it associated?
- b. Define and discuss the concept of transitive dependency.

6.

The following relational database schema is designed for an engineering firm that undertakes civil construction projects. The database keeps track of employees and departments of the firm and projects undertaken by it.

EMPLOYEE (fname, lname, nid, bdate, address, sex, salary, supernid, dno)  
DEPARTMENT (dname, dnumber, mgrnid)  
PROJECT (pname, pnumber, dnum)  
WORKS\_ON (enid, pno, hours)  
DEPENDENT (enid, dpndnt-name, dpndnt\_sex, dpndnt\_bdate, relationship)

Use MySQL queries to perform the following queries.

- i. Define the database structure with appropriate data types and primary keys.
- ii. Enforce Foreign keys to appropriate tables.
- iii. Describe structure of table.
- iv. Retrieve the salary of every employee.
- v. Find the names of all employees who are directly supervised by 'Ranasinghe'.
- vi. Retrieve the names of all employees who were born before 1945.
- vii. Retrieve the name and address of each employee who works on all the projects controlled by department number 7.
- viii. List the last names of department managers who have at least one female dependent.

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