



DURATION: TWO HOURS

Date: 16<sup>th</sup> July, 2010

Time: 10.00 am – 12.00 noon

Answer FOUR Questions ONLY.

Q1.

- i. What do you understand by the terms *Data* and *Information*? Briefly describe them.
- ii. Give an example for a *Manual Database*. What are the difficulties of a manual database? Explain with respect to your example.
- iii. A computer database is a shared/integrated computer structure. Unlike in a manual database, some additional facts are kept in a computer database. What are they? Give examples.
- iv. Give three tasks that should be done in order to convert a manual file system into a matching computer file system?

Q2.

- i. What do you understand by *Structural* and *Data Dependency* in the context of file structure?
- ii. What is *Data Redundancy*? Briefly explain by giving examples.
- iii. Briefly describe the three types of anomalies that could occur due to data redundancy.
- iv. A particular organization needs to keep track of its employees. They keep each employee's name, job description and address. The management needs to list employees according to the surname and the city they live. The name of the file containing the data is called as "EMPLOYEE". Identify the suitable fields for this file to achieve the needs of the management. Use proper naming conventions.

Q3.

- i. A system is to be designed to support the running of an academic conference. Develop an entity relationship diagram for this system on the basis of the following information (make any reasonable or realistic assumptions):

Papers are submitted by authors to the conference. Submitted papers are, of course, written by at least one author and often more than one. Nevertheless, one author is always designated as the "corresponding author", which means that any correspondence regarding the paper is

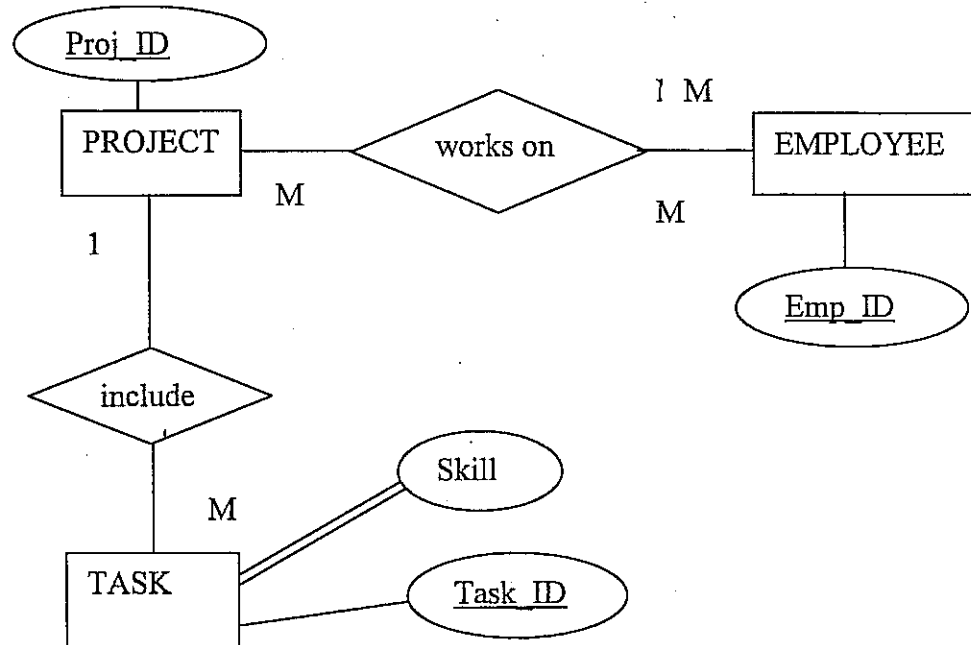
to be sent to that particular person. Naturally, when there is only one author, that person is also the corresponding author. Submitted papers are sent to independent reviewers (usually three per paper) for comments and assessments. Reviewers may, or may not, be authors of other submitted papers and also may, or may not, actually attend the conference itself. The reviewers of a paper return their comments and recommendations regarding whether or not the paper should be accepted for presentation at the conference. Papers that are recommended for acceptance by the reviewers are scheduled for presentation at the conference provided at least one of the authors registers to attend and present the paper in person. Each accepted paper is allotted a specific slot (i.e. date, time and room) for presentation at the conference itself. Paper presentations may be run in parallel. That is, different presentations may be run on the same day and time but, of course, in different rooms. Participants at the conference are required to pay a conference fee that includes attendance at the paper presentation sessions and meals and (optionally) accommodation and the conference dinner. Any special requirements that participants may have (e.g. as a result of disabilities or special dietary needs) also have to be recorded.

**Q4.**

- i. Give examples for the following
  - (a) Simple and Composite attributes
  - (b) Derived attribute
  - (c) Recursive relationship
- ii. What is a Weak entity and how is it represented in an ER diagram? Give an example.
- iii. What are Multi-valued attributes? What two courses of action are available to a designer when a multi-valued attribute is encountered?
- iv. Which course of action is the best?
- v. Draw E-R diagrams showing the cardinality for the following:
  - a. An invoice is sent to one customer, and many invoices can be sent to the same customer
  - b. A part is used in many projects, and many projects use the part
  - c. A person works in one department, and there are many persons in a department.
  - d. A vehicle is owned by one person, and a person can own many vehicles.
  - e. Students take subjects. Each subject can be taken by many students, and each student can take many subjects
  - f. Persons apply for loans. Each loan must be made to one person, but each person can make many applications.
  - g. An operator can work on many machines, and each machine has many operators. Each machine belongs to one department, but a department can have many machines.

Q5

Answer the following questions based on the E-R diagram given below. In each case, give reasons or an appropriate example to support your answer:



- i. How many projects can an employee work on?
- ii. How else might the attribute *Skill* be modeled?
- iii. Is it possible to attach attributes to the *includes* relationship? If yes, give an example; if no, explain the reason.
- iv. For a project that a particular employee is working on, is it possible to identify which tasks are included in that project the employee is undertaking? Briefly explain your answer.

Q6.

- i. Use the scenario described by "An employee can work on many projects and a project can have many employees" as the basis for an entity relationship diagram presentation.

We need to keep track of each employee's name, employee number, job classification, amount of Rupees paid per hour for a particular job classification, number of hours worked by an employee on a particular project, project number and the project name.

- ii. Describe the ERD by considering the attributes of each entity and the relationship type. State any assumptions you make.
- iii. Map the above ERD and obtain the Relational schema.
- iv. Normalize the relations. State clearly the normal forms you apply.
- v. Study the tables obtained (3NF) and make a change to improve the table structure. Obtain new relations. State clearly the effects of the change you make.

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