



Date: 08.06.2007

Time: 2.00pm – 4.00pm

Answer **FOUR** questions **ONLY**

(01)

(i) Discuss each of the following terms:

- a) Data b) Attribute c) Record d) Table

(ii) What is *data redundancy* and which characteristics of the file system can lead to it?

(iii) What is *data independence* and why is it important?

(iv) What is a *DBMS* and what are its functions?

(v) What are *connectivities* and what role do they play in database design?

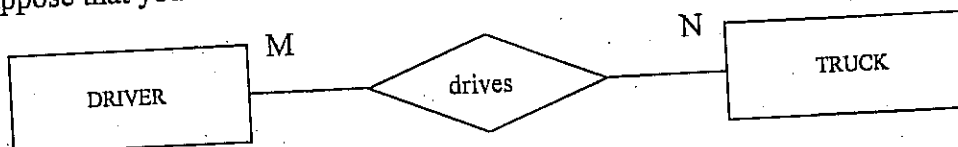
In an organization, there are employees (e_1, e_2, \dots, e_n), departments (d_1, d_2, \dots, d_n) and projects (p_1, p_2, \dots, p_n). By considering the relationships *manges*, *works_for* and *works_on* between employees, departments and projects, explain the *three types of relationships* associated among data. State clearly any assumptions you make.

(02)

(i) Compare and contrast *Database Systems* and *File Systems*.

(ii) 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 suitable fields for this file to achieve the needs of the management. Use proper naming conventions.

(iii) Suppose that you have the entity relationship model shown in the following figure:



Note: During some time interval, a *DRIVER* can drive many different *TRUCK*s and any *TRUCK* can be driven by many *DRIVERS*s

How would you convert this model into an entity relationship model that displays only 1:M relationships? (Make sure that you draw the revised entity relationship model)

(03)

(i) "Within the broad key classification, several specialized keys can be Defined." Discuss what you mean by the following:

- (a) Super Key (b) Candidate Key (c) Primary Key

(ii) Consider the following set of requirements for a University Database.

- (a) The university consists of several faculties and only one dean administrates each faculty.
- (b) Each faculty consists of several departments and these departments offer courses.
- (c) Each department has students who take courses.
- (d) Lecturers are attached to departments and for a course, combined teaching is allowed.

Identify the *entities* and draw the *conceptual schema* for this database application. Show clearly the *attributes* and *relationship types* among entities. State clearly any assumptions you make.

(04)

(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.

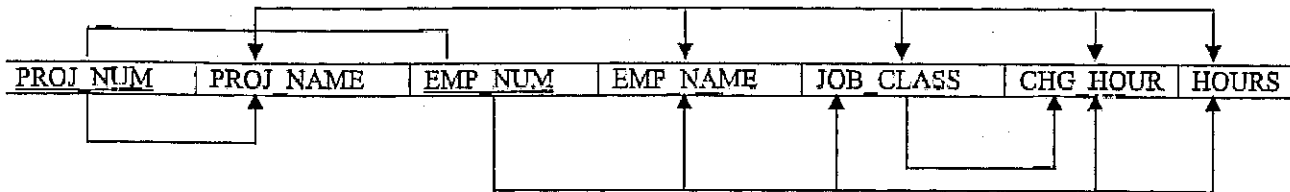
(iii) What are *Multi-valued attributes*? What two courses of action are available to a designer when a multi-valued attribute is encountered? Which course of action is the best?

(iv) "*Controlled Redundancy makes the relational database work.*" Explain using an illustrated example.

(v) Using the same example used for part(iv), show that it violates *referential integrity*.

(05)

- (i) What is *normalization*? When is a table in 1NF, 2NF and in 3NF?
- (ii) You are given the *dependency diagram* as shown below:
Identify and discuss each of the indicated dependencies.



- (iii) Create a database for the above attributes in (ii) whose tables are at least in 2NF, showing the dependency diagrams for each table.
- (iv) Create a database for the above attributes in (ii) whose tables are at least in 3NF, showing the dependency diagrams for each table.
- (v) What three *data anomalies* are likely to be the result of *data redundancy*? How can such anomalies be eliminated?

(06)

- (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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