**Unit – I**

**Explain the architecture of a database system and its various components along with suitable diagram.**

**What is relational algebra? Explain its various operations.**

Draw E-R schema diagram for COMPANY database with all components and explain.

Draw an E-R diagram for a banking enterprise with all components and explain.

Design a database using ER model to store IPL match details based on the requirements

given below.

a. Player will have id, name, country and price

b. Team will have short name, name, owner and homeground.

c. Each team will have at least one player

d. Each player plays for at most one team

e. Each team plays match against atleast one other team, on specified date, time and

ground. Winner of the match should be recorded.

The ER diagram should specify entity sets, relationship sets, participation details,

cardinality ratio, primary key and weak entity sets(if any).

Convert the above ER diagram into Relational schema. Explain the conversion steps

briefly.

Supreme Products manufactures products like pressure cookers, cookwares, water purifiers, food processors etc. The company markets its products to wholesalers all over the country and dealers sell them to customer. The company has five regional offices and many sales persons are attached to regional offices. Salespersons contact dealers and explain about products, incentives offered, training programs for wholesalers and demo for customers etc. Dealers place orders with the salespersons attached with the regional office of their location. After receiving goods, they make payments, which may be in installments. Company would like to develop a system to monitor sales of different products, performance of salespersons and orders from wholesalers. Do the following:

(i) Identify entities, attribute and relationships giving functionalities and draw E-R diagram for the system.

(ii) Convert this to relational tables explaining logic involved.

Suppose that we have a ternary relationship R between entity sets A, B, and C such that A has a key constraint and total participation and B has a key constraint; these are the only constraints. A has attributes a1 and a2, with a1 being the key; B and C are similar. R has no descriptive attributes. Construct SQL statements that create tables corresponding to this information so as to capture as many of the constraints as possible. If you cannot capture some constraint, explain why.?

With a neat sketch, Illustrate the two different types of ordered indices and relatively show how they are differing to access a particular value using index entry to gain fast random access to records in a file.

Explain the structure of B+ tree with suitable example.

**Unit – II**

Consider the following tables.

Emp(emp\_no, name, salary, supervisor\_no, sex\_code, dept\_code)

Dept(dept\_code, dept\_name)

Write down queries in SQL for getting following information:

i. Employees getting more salary than their supervisor.

ii. Department name and total number of employees in each department who earn more

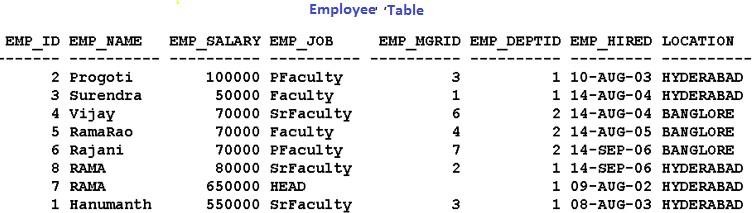
than average salary for their department

iii. Department(s) having maximum employees earning more than 25000.

iv. Name of employee(s) who earn maximum salary in their organization.

v. Find names of employees whose salary is greater than average salary.

Note the below Table Structure:



Department Table

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Dept\_ID Dept\_Name

1 CPP

2 UNIX

3 Oracle

4

a. Create above Two tables as per the below condition

Create the above two tables in such a way that EMP\_DEPTID value entering for Employee table should be exists in department Table

Use the tables created in the step# a, above and Develop the Queries for the below requirements

b. Display Manage Name for each and Every Employee along with employee details in the Employee Table?

c. Display department name along with the employee details for each employee

d. Display the Employees Whose salary is more than RAJANI?

e. Display the LOCATION wise salary for the employee table?

f. Display all the Employees who are reporting to HANUMANTH’s Manager?

g. Display employee details, who is least salaried person in the Organization?

h. Select the Least most and least experience Employee details.

i. Display employee details whose salary is greater than the average salary of his location, for which the employee belongs to?

j. Display all the employees details along with the department details

Note: If the employee is tagged to department display department and respective employee details Else display only the employee details, if not tagged to any department

Assume that there is a table with below columns

EmpId ProjectId HoursWorked ProjectName EmployeeName

----------------------------------------------------------------------------------------------------------------

1 p1 20 MS RAM

1 P2 30 LS RAM

2 p1 30 MS RAJ

2 P2 20 LS RAJ

a. Explain the Normalization form in which the above table is in currently and why?

b. Convert the above table into next normal form

For Ex: If the above table is in first Normal form convert to second

If the above table is in second Normal form convert into third

A engineering consultancy firm supplies temporary specialized staff to bigger companies in the country to work on their project for certain amount of time. The table below lists the time spent by each of the company’s employees at other companies to carry out projects. The National Insurance Number (NIN) is unique for every member of staff.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NIN** | **Contract No** | **Hours** | **Employee Name** | **Company ID** | **Company Location** |
| 616681B | SC1025 | 72 | P. White | SC115 | Belfast |
| 674315A | SC1025 | 48 | R. Press | SC115 | Belfast |
| 323113B | SC1026 | 24 | P. Smith | SC23 | Bangor |
| 616681B | SC1026 | 24 | P. White | SC23 | Bangor |

1. Explain in which normal form this table is
2. Find the Primary Key for this relation and explain your choice.
3. Find the **Fully Functional Dependencies** on the PK and the **Partial Dependencies** on the PK.
4. Normalise the table to 2NF
5. Find the transitive dependencies on the 2NF tables
6. Normalise the tables to 3NF – Express the tables in DBML language and show the PK and FK in all the relations.

The following table is already in first normal form (1NF). There is only one entry per field.

Please convert this table to the third normal form (3NF) using the techniques you learned.

A table with the students and their grades in different topics.

UnitID StudentID Date TutorID Topic Room Grade Book TutEmail

U1 St1 23.02.03 Tut1 GMT 629 4.7 Deumlich tut1@fhbb.ch

U2 St1 18.11.02 Tut3 GIn 631 5.1 Zehnder tut3@fhbb.ch

U1 St4 23.02.03 Tut1 GMT 629 4.3 Deumlich tut1@fhbb.ch

U5 St2 05.05.03 Tut3 PhF 632 4.9 Dümmlers tut3@fhbb.ch

U4 St2 04.07.03 Tut5 AVQ 621 5.0 SwissTopo tut5@fhbb.ch

**Unit – III**

Explain the steps involved in query processing with neat flowchart and highlight how query processing is to translate a given query into its internal form.

Explain the optimizer uses equivalence rules to transform expressions into other logically equivalent expressions.

Consider three transactions: T1, T2 and T3. Draw the precedence graph for the

following schedule consisting of these three transactions and determine whether it is

serializable. If so, give its serial order(s).

**Time T1 T2 T3**

t1 : read(Y)

t2 : read(Z)

t3 : read(X)

t4 : write(X)

t5 : write(Y)

t6 : write(Z)

t7 : read(Z)

t8 : read(Y)

t9 : write(Y)

t10 : read(Y)

t11 : write(Y)

t12 : read(X)

t13 : write(X)

Describe Two Phase Locking protocol with suitable example.

Illustrate any one of the concepts of deadlock detection, deadlock avoidance and deadlock prevention.

Explain time stamp based concurrency control and correctness of timestamp ordering protocol.

**Unit – IV**

Discuss various types of security issues for a database.

Compare and contrast DAC, MAC, RBAC.

**Briefly explain about the two approaches to storing the relation in the distributed database.**

**What are the various types of Distributed Database Systems? Explain fragmentation in distributed database systems.**

Explain the data warehouse architecture and its components with a suitable diagram.

Narrate decision tree induction algorithm for classification with suitable example