

Design and Implementation of Geospatial Information System.

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Q.2. Explain entity and schema with example. Explain advantages of DBMS over traditional system.

Entity: A real world thing or an interaction between two or more real world things; that can be easily identifiable.

Schema: The overall design of the database is called the schema of database.

The logical structure of the database (e.g., set of customers and accounts and the relationship between them).

The advantages of DBMS over traditional system are:

① NO redundant data

Redundancy removed by data normalization.

No data duplication saves storage and improves access time.

Data Consistency and Integrity.

Since data normalization takes care of the data redundancy, data inconsistency also been taken care of as part of it.

Data Security:

It is easier to apply access control in database systems so that only authorized user is able to access the data.

Privacy:

Limited access means privacy of data. DBMS can grant and revoke access to the database on user level that ensures who's accessing which data.

Easy access to data

Database systems manage data in such a way so that the data is easily accessible with fast response times. It provides faster access and updation of data.

Easy recovery:

Since database systems keeps the backup of data, it is easier to do a full recovery of data in case of a failure.

⑦ flexible.

Database systems are more flexible. Its size can be increased and decreased based on the amount of storage required. It also allows addition of additional tables as well as removal of existing tables without disturbing the consistency of data.

Q2) Define weak entity. Briefly explain elements of data model.

⇒

A weak entity is an entity that must be defined by a foreign key relationship with another entity as it cannot be uniquely identified by its own attributes alone.

Elements of Data model are:

① Entity

(A real world thing or an interaction between two or more real world things.)

② Attribute

(The atomic pieces of information that we need to know about entities.)



③ Relationship

Show entities depend on each other in terms of why the entities depend on each other (the relationship) and what that relationship is. (the cardinality of the relationship).

Customer
customer no., name.

Sale
customer no.
product no.
date

product
product name
price

→ "Customer" is an entity.
→ "product" is an entity.

→ for a "Customer" we need to know their "customer number" attribute and "name" attribute.

? for a "product" we need to know the "product name" attribute and "price" attribute.

Relationships are created between tables using the primary key field and a foreign key field.

- **one to one Relationship** :- one record in a table relates to one record in another table.
- **one to many Relationship** :- one record in a table can relate to many records in another table.
- **many to many Relationship** :- many records in one table can relate to many records in another table.

Q3) Normalize the following table . (3NF)

Item	Colors	Price	TAX
Sweatshirt	blue, black	25.00	1.25
T-shirt	red, blue	12.00	0.60
POLO	red, yellow	12.00	0.60
T-shirt	red, blue	12.00	0.60

Soln.

In third Normal form (3NF)

- NO non-key field depends upon another.
- All non-key fields depend only on the primary key .

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Third Normal form.

Item	color
T-shirt	red
T-shirt	blue
Polo	red
Polo	Yellow
Sweatshirt	blue
Sweatshirt	black

item price

T-shirt 12.00

Polo 12.00

Sweatshirt 25.00

XAT 5/125

25% 125 100 25

100 25% 125 100 25

Price Tax 12.00 0.60 12.60

25.00 1.25 26.25

Q4: Create a table Department and complete the following task. (Consider relevant attribute):

- Increase the salary of each instructor in the computer science department by 10%.
- Find the highest salary of any instructor.
- Find all instructors earning the highest salary. (There may be more than one with the same salary).
-

a)

Create table department (

- Dept_name varchar (20),
- Salary numeric (12,2),
- Instructor varchar (20))

Select salary & i.i from instructor;

b)

Create table department (

- Dept_name varchar (20),
- Salary numeric (12,2),
- Instructor varchar (20))

Select max (salary) from department;

B5)

Explain advantages and disadvantages of spatial DBMS.

=>

Advantages of SDBMS:

- ① Able to treat spatial data like anything else in the database.
- ② Offset: Complicated back to the DBF version.
 - organization and indexing done for you.
 - Do not have to re-implement operators
 - Do not have to re-implement functions.
- ③ Significantly lower the development time of client applications.
 - Spatial querying using SQL
- ④ We simple SQL expressions to determine spatial relationships.
 - Distance, containment.
- ⑤ We simple SQL expressions to perform spatial operations.
 - Area, length, intersection, union, buffer

Disadvantages of SDBMS

- ① Cost to implement can be high.
- ② Some inflexibility.
- ③ Incompatibilities with some DBMS software.
- ④ Slower than SQL; specialized data structures.

Q6. CREATE a table (geometries) then INSERT a point, a line, a polygon with a hole, a polygon and a collection. Also display the inserted data.

>

```
CREATE TABLE geometries (name varchar,  
geom geometry);
```

```
INSERT INTO geometries VALUES  
(('point', 'POINT(0 0)'),  
('linestring', 'LINESTRING(00, 11, 21, 22)'),  
('polygon', 'POLYGON((0,0, 10,11, 02,00))'),  
('polygon with hole', 'POLYGON((0,0, 10,0, 0,10, 010,00),  
(11, 12, -22, -21,11))'),  
('collection', 'GEOMETRYCOLLECTION(POINT(20),  
POLYGON((00, 10, 11, 02,00)))');
```

```
SELECT * FROM geometries;
```

Q.2. Explain Entity-based model for geographic space modelling.

=)

Geographic object has two components:

- 1) a description
- 2) a spatial component.

In order to distinguish an object from others, an explicit identity is assigned for it. The interpretation of space depends on the semantics associated with the geographic entity. In practice one uses one of the following types of spatial objects:

(1) Zero-dimensional objects

points are used for representing the location of entities whose shape is not considered as useful or when area is either small with respect to the embedding space size, e.g., cities, churches, on a large scale map...).

(2) One-Dimensional Objects or linear objects

These objects are commonly used for representing networks. The basic geometric type is polyline.

A Polyline is defined as a final set of line segments or edges such that each segment endpoint is shared by exactly two segments except for two end points, which belong to only one segment. A polyline is closed if the two extreme points are identical.

(a)



The segment.



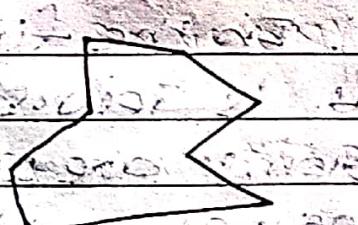
polyline. (b)



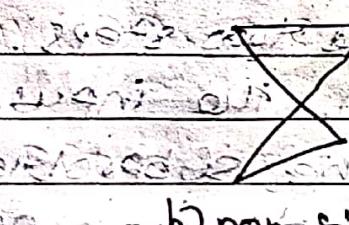
c) closed polyline

③ Two Dimensional object or surface object.

- used for representing entities with large area.
- polygons constitute the main geometric type.
- polygon is a region of the plane bounded by a closed polyline, called its boundary.
- a polygon is simple if its boundary is a simple polyline.



a) Simple polygon.



b) non-simple polygon.



c) polygon with hole.

Q. 8

Explain any two useful algorithms useful in computational geometry.

Two useful algorithms in computational geometry are:

① Incremental algorithms: The Convex-Hull example.

An "incremental algorithm" uses a straight forward strategy that works as follows. The idea is to first take a subset of the input small enough so that the problem is easily solved, and then to add, one by one, the remaining elements of the input while maintaining the solution at each step.

② Divide-and-Conquer strategy: The Half-plane Intersection example.

The divide-and-conquer strategy has for a long time proved effective in many situations. It relies on a recursive approach and has two steps. In the first step (top-down), the input is recursively divided until the subproblems are small enough in size to be solved easily.

The second step (bottom-up): Computation of recursive merging of the solutions. This strictly is allowed in sorting algorithms such as merge sort and quicksort.

→ Building the structure

The set of n half-planes in the input is recursively halved until one obtains n singleton half-planes. This yields a binary tree.

→ Solving an atomic problem

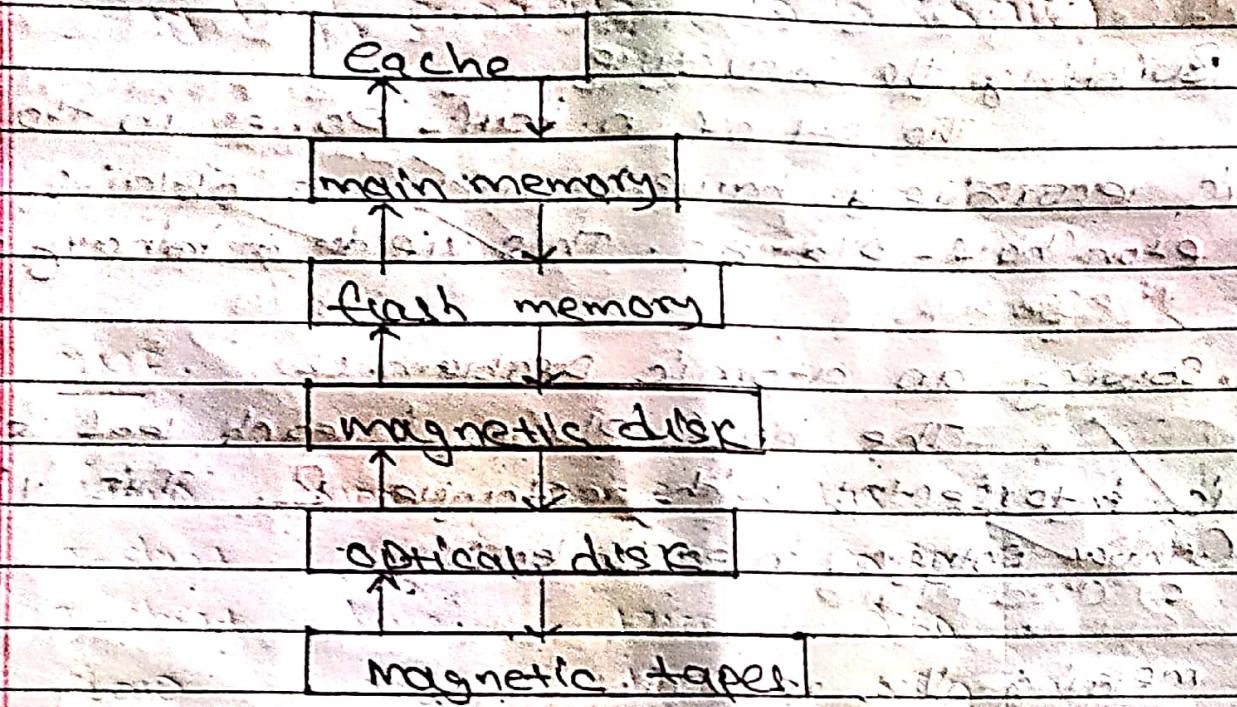
The half-plane in each leaf singleton is intersected with rectangle R . This yields a convex polygon in each leaf.

→ merging the results

Compute recursively the intersection of the convex polygons (going up in the structure defined in the first item in this list.)

Q.9. Explain various types of memory with their hierarchy.

⇒ The various types of memory with their hierarchy are:



fig'. Hierarchy:

① cache memory.

fastest and most costly form of storage ; 'Volatile' , managed by Computer System hardware.

② main memory.

- fast access.
- Generally too small to store the entire data type.
- Capacities upto few mega bytes widely used currently.

- Volatile - contents of main memory are usually lost after power failure or system crash occurs.

③ flash memory

- Data survives power failure.
- Data can be written at a location only once, but location can be erased and written to again.
- Can support only a limited number of write/erase cycles.
- Widely used in embedded devices such as digital cameras, phones, USB key).

④ magnetic disk

- Data is stored on spinning disk, and read/written magnetically.
- Primary medium for the long-term storage of data, typically store entire database.
- Survives power failures and system crashes.

⑤ optical disc

- Non-volatile, data is read optically from a spinning disc using a laser.
- CD-ROM, DVD-RW etc.
- Read and writes slower than magnetic discs.

- (6) magnetic tapes:
- non-volatile, used primarily for backup and for archival data
 - sequential access - much slower than disk
 - very high capacity (40 to 300 GB)

(Q8).

item	color	price	tax
T-shirt	red	12.00	0.60
T-shirt	blue	12.00	0.60
POLO	red	12.00	0.60
POLO	yellow	12.00	0.60
Sweatshirt	blue	28.00	1.25
Sweatshirt	black	28.00	1.25

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BNR

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