UNIT-1

1.What is GIS?

A geographic information system (GIS) is a computer system for capturing, storing, querying, analyzing and displaying geospatial data. One of many applications of GIS is disaster management.

2.What are the information given by geospatial data?

Geospatial data describe both the locations and characteristics of spatial features. To describe a road, for example, we refer to its location (i.e., where it is) and its characteristics (e.g., length, name, speed limit, and direction).

3.How can you represent the special features on Earth's surface?

The locations of spatial features on the Earth's surface are based on a geographic coordinate system expressed in longitude and latitude values.

4.Define geographic coordinate system?

The geographic coordinate system is the reference system for locating spatial features on the Earth's surface. The geographic coordinate system is defined by longitude and latitude. Both longitude and latitude are angular measures: longitude measures the angle east or west from the prime meridian, and latitude measures the angle north or south of the equatorial plane.

5.Define meridian.

Meridians are lines of equal longitude. The prime meridian passes through Greenwich, England, and has the reading of 0°. Using the prime meridian as a reference, we can measure the longitude value of a point on the Earth's surface as 0° to 180° east or west of the prime meridian.

6.List out various coordinate systems used in United States.

Three coordinate systems are commonly used in the United States: the Universal Transverse Mercator (UTM) grid system, the Universal Polar Stereographic (UPS) grid system, and the State Plane Coordinate (SPC) system.

7.What are the components of GIS?

Hardware

Software

People

Methods

Data

8.List out the elements of GIS.

Geospatial data

Data acquisition

Data management

Dta display

Data exploration

Data analysis

9.How will you represent spatial features in vector data model?

The *vector data model* uses points, lines, and polygons to represent spatial features with a clear spatial location and boundary such as streams, land parcels, and vegetation stands.

10.How will you represent spatial features in raster data model?

The *raster data model* uses a grid and grid cells to represent spatial features: point features are represented by single cells, line features by sequences of neighbouring cells, and polygon features by collections of contiguous cells.

11.Define data exploration.

Data exploration refers to the activities of visualizing, manipulating, and querying data using maps, tables, and graphs. These activities offer a close look at the data and function as a precursor to formal data analysis.

12. What is data analysis? List out few tools.

A GIS has a large number of tools for data analysis. Some are basic tools, meaning that they are regularly used by GIS users. Other tools tend to be discipline or application specific. Two basic tools for vector data are buffering and overlay: buffering creates buffer zones from select features, and overlay combines the geometries and attributes of the input layers.

13.Give few applications of GIS.

- Online mapping websites offer locators for finding real estate listings, vacation rentals, banks, restaurants, coffee shops, and hotels.
- Location-based services allow mobile phone users to search for nearby banks, restaurants, and taxis; and to track friends, dates, children, and the elderly.
- Mobile GIS allows field workers to collect and access geospatial data in the field.

- Mobile resource management tools track and manage the location of field crews and mobile assets in real time.
- Automotive navigation systems provide turn by-turn guidance and optimal routes based on precise road mapping using GPS and camera.
- Augmented reality lets a smart phone user look through the phone's camera with superimposed data or images (e.g., 3-D terrain from a GIS, monsters in Pokemon Go) about the current location.

14.Classify the scales of measurement.

Scales of Measurement or level of measurement is a system for classifying attribute data into four categories namely nominal, ordinal, interval and ratio.

15.Write short notes on ArcGIS.

ArcGIS is composed of applications and extensions at three license levels. The applications include ArcMap,ArcGIS Pro, ArcCatalog, ArcScene, and ArcGlobe, and the extensions include 3D Analyst, Network Analyst, Spatial Analyst, Geostatistical Analyst, and others.

UNIT-2

1.Define data model.

Data model defines the logical structure of a database. Data Models are fundamental entities to introduce abstraction in a DBMS. Data models define how data is connected to each other and how they are processed and stored inside the system. There are a number of different database data models.

2.What is an ER diagram?

An Entity–relationship model (ER model) describes the structure of a database with the help of a diagram, which is known as Entity Relationship Diagram (ER Diagram). An ER model is a design or blueprint of a database that can later be implemented as a database. ER Model is best used for the conceptual design of a database.

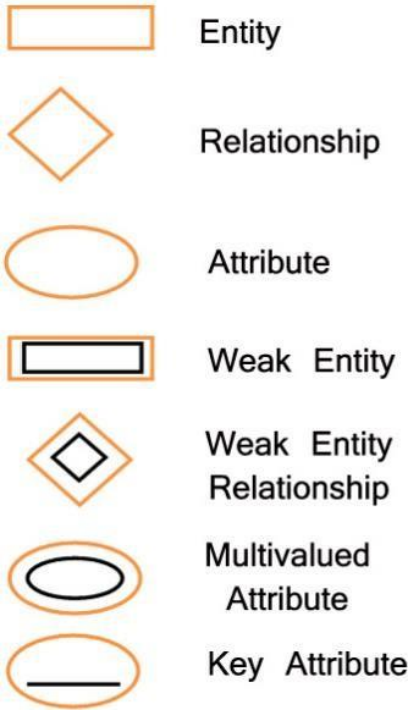
3.Liist out the components of ER diagram?.

The components of an ER diagram are,

Entity

Relationship

4.Draw few symbols used in ER diagram.



5.Brief about a point. Give examples.

A point has zero dimension and has only the property of location. A point feature is made of a point or a set of points. Wells, benchmarks, and gravel pits on a topographic map are examples of point features.

6.brief about a polygon.

Polygon is two-dimensional and has the properties of area (size) and perimeter, in addition to location. Made of connected, closed, nonintersecting lines, the perimeter or the boundary defines the area of a polygon.

7.Define topology.

Topology refers to the study of those properties of geometric objects that remain invariant under certain transformations such as bending or stretching. An example of a topological map is a subway map.

8. What is an edge in a graph?

An edge or arc is a directed line with a starting point and an ending point. The end points of an arc are nodes, and intermediate points, if any, are vertices.

9.What are the advantages of topology?

Topology has three main advantages. First, it ensures data quality and integrity. Second, topology can enhance GIS analysis. Third, topological relationships between spatial features allow GIS users to perform spatial data query.

10.What do you mean by data compression?

Data compression refers to the reduction of data volume, a topic particularly important for data delivery and Web mapping. Data compression is related to how raster data are encoded. Quadtree and RLE, because of their efficiency in data encoding, can also be considered as data compression methods.

11.Write short notes on lossy compression.

A lossy compression cannot reconstruct fully the original image but can achieve higher compression ratios than a lossless compression. Lossy compression is therefore useful for raster data that are used as background images rather than for analysis. Image degradation through lossy compression can affect GIS-related tasks such as extracting ground control points from aerial photographs or satellite images for the purpose of georeferencing.

12.What is block coding?

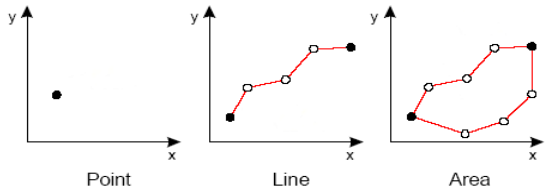
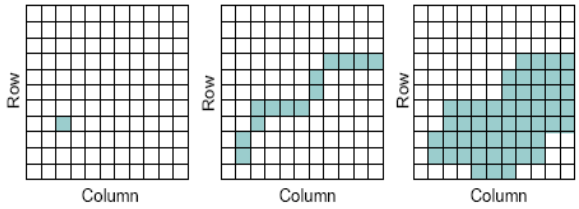
The block coding raster storage technique assigns areas that are blocks to reduce redundancy. The block coding raster image compression method subdivides an entire raster image into hierarchical blocks. It's an extension of the run length encoding technique, but extends it to two dimensions.

13.Define quadtree.

Quadtrees are raster data structures based on the successive reduction of homogeneous cells. It recursively subdivides a raster image into quarters. The subdivision process continues until each cell is classed.

14.Differentiate between vector and raster images.

Vector	**Raster**
Usually Complex.	Usually Simple.
Difficult for overlay operation.	Efficient for overlay operation.
High spatial variability is inefficiently represented.	High spatial variability is efficiently represented.
Small file size.	Large file size.

Vector data model is often used for representing discrete features with definable boundaries.	Raster data model is widely used for representing continuous spatial features.
Example:  	Example: 

15.What do you mean by TIN.

A commonly used data structure in GIS software is the triangulated irregular network (TIN). It is on the standard implementation techniques for digital terrain models, but it can be used to represent any continuous field. The principles behind a TIN are simple. It is built from a set of locations for which we have a measurement for instance an elevation.

UNIT-3

1.List out the problems to be addressed while preparing the data model.

- the re-projection of data from different map sources to a common projection;
- the generalization of complex data to provide a simpler data set; or
- the matching and joining of adjacent map sheets once the data are in digital form.

2.What is the function of a scanner?

Scanning coverts paper maps into digital format by capturing features as individual cells, or pixels, producing an automated image. Maps are generally considered the backbone of any GIS activity. The technology used for this kind of conversions is known as scanning and the instrument used for this kind of operation is known as a scanner.

3.What does a scanner head contain?

The scanner head contains either a charged-couple device (CCD) sensor or a contact image (CIS) sensor. A CCD consists of a number of photosensitive cells or pixels packed together on a chip. The most advanced large format scanners use CCD's with 8000 pixels per chip for providing a very good image quality.

4.List out few types of scanners?

Hand-held scanners

Flatbed scanners

Drum scanners

5.What do you know about a raster data?

Raster data is made up of pixels (also referred to as grid cells). They are usually regularly-spaced and square but they don't have to be. Rasters have pixel that are associated with a value (continuous) or class (discrete).

6.What do you know about vector data?

Vector data is not made up of grids of pixels. Instead, vector graphics are comprised of vertices and paths. The three basic symbol types for vector data are points, lines and polygons (areas).

7.Define digitizing.

Digitizing in GIS is the process of converting geographic data either from a hardcopy or a scanned image into vector data by tracing the features. During the digitzing process, features from the traced map or image are captured as coordinates in either point, line, or polygon format.

8. List out the types of digitizing.

Manual digitizing

Heads up digitizing

Automated digitizing

9.Mention the stages followed in manual digitizing.

Registration

Digitizing point fetaures

Digitizing line fetaures

Digitizing polygon fetaures

Adding attribute information

10.What are the different modes available in manual digitization?

Manual digitizers may be used in one of two modes: point mode or stream mode. In point mode the user begins digitizing each line segment with a start node, records each

change in direction of the line with a digitized point and finishes the segment with an end node. Thus, a straight line can be digitized with just two points, the start and end nodes.

11.Define topology.

Topology is the mathematical representation of the physical relationships that exists between the geographical elements. Topology has long been a key GIS requirement for data management and integrity.

12.What are the topological concepts supported by the topological structure?

The topological structure supports three major topological concepts:

- Connectivity: Arcs connect to each other at nodes.
- Area definition: Arcs that connect to surround an area define a polygon.
- Contiguity: Arcs have direction and left and right sides.

13.Define connectivity.

Connectivity is defined through arc-node topology. This is the basis for many network tracing and path finding operations. Connectivity allows you to identify a route to the airport, connect streams to rivers, or follow a path from the water treatment plant to a house.

14.Define contiguity.

Two geographic features that share a boundary are called adjacent. Contiguity is the topological concept that allows the vector data model to determine adjacency. Polygon topology defines contiguity. Polygons are contiguous to each other if they share a common arc. This is the basis for many neighbor and overlay operations.

15.What are the types of GIS data? Define them.

There are two types of GIS data: spatial data (coordinate and projection information for spatial features) and attribute data. Attribute data is additional information appended in tabular format linked with spatial features. The attribute data is linked with spatial data through unique id (i.e. feature ID). The spatial data contains information about where and attribute data can contain information about

what, where, and why. Attribute data provides characteristics about spatial data.

UNIT 4

1.Mention few types of analysis used in vector data.

- Buffering
- Overlay
- Distance Measurement
- Pattern Analysis
- Feature Manipulation

2.What are the areas created by proximity in buffering?

Based on the concept of proximity, buffering creates two areas: one area that is within a specified distance of select features and the other area that is beyond. The area within the specified distance is the buffer zone.

3.Give some applications of buffering.

- Government regulations may set 2-mile buffer zones along streams to minimize sedimentation from logging operations.
- A national forest may restrict oil and gas well drilling within 500 feet of roads or highways.i
- A planning agency may set aside land along the edges of streams to reduce the effects of nutrient, sediment, and pesticide runoff; to maintain shade to prevent the rise of stream temperature; and to provide shelter for wildlife and aquatic life
- A planning agency may create buffer zones around geographic features such as water, wetlands, critical habitats, and wells to be protected and exclude these zones from landfill consideration.

4.Define overlying.

An overlay operation combines the geometries and attributes of two feature layers to create the output. The geometry of the output represents the geometric intersection of featuresfrom the input layers.

5.How do we implement overlays?

The overlay methods are based on the Boolean connectors AND, OR, and XOR. Intersect uses the AND connector. Union uses the OR connector. Symmetrical

Difference or Difference uses the XOR connector. Identity or Minus uses the following expression: [(input layer) AND (identity layer)] OR (input layer).

6.How are the features preserved by Symmetrical difference?

Symmetrical Difference preserves features that fall within the area extent that is common to only one of the inputs. In other words, Symmetrical Difference is opposite to Intersect in terms of the output's area extent.

7.Mention few applications of overlays.

Querying and modeling applications

Areal interpolation problem

8.Define distance measurement. Mention its uses.

Distance measurement refers to measuring straight line (Euclidean) distances between features. Measurements can be made from points in a layer to points in another layer, or from each point in a layer to its nearest point or line in another layer. In both cases, distance measures are stored in a field. Distance measures can be used directly for data analysis.

9.What do you mean by pattern analysis?

Pattern analysis is the study of the spatial arrangements of point or polygon features in two dimensional space. Pattern analysis uses distance measurements as inputs and statistics (spatial statistics) for describing the distribution pattern. At the general (global) level, a pattern analysis can reveal if a point distribution pattern is random, dispersed, or clustered

10.How do you perform nearest neighbor analysis?

A classic technique for point pattern analysis, nearest neighbour analysis uses the distance between each point and its closest neighbouring point in a layer to determine if the point pattern is random, regular, or clustered. The nearest neighbour statistic is the ratio (R) of the observed average distance between nearest neighbours (d_{obs}) to the expected average for a hypothetical random distribution (d_{exp}):

$$R = \frac{d_{\text{obs}}}{d_{\text{exp}}}$$

11. Classify the scales of measurement.

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15.Define reclassification.

A local operation, reclassification creates a new raster by classification. Reclassification is also referred to as recoding, or transforming, through lookup tables. Two reclassification methods may be used. The first method is a one-to-one change, meaning that a cell value in the input raster is assigned a new value in the output raster.