# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE 7 SEMESTER – OLD PAPER – SUMMER 2022 TO WINTER 2025 – QUESTION BANK**

**Subject Name & Code:** Application of GIS in Civil Engineering - 3170617

## Chapter 1 – GIS and civil engineering projects

### Repeated Questions:

**1. General Applications of GIS in Civil Engineering:**

- **Q.** Explain how GIS is useful in civil engineering projects / Enlist the application of GIS in Civil Engineering / Explain the significance of GIS in civil engineering projects. **(WINTER 2022, 4 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 4 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 3 Marks)**

**2. Water Resources, Water Supply and Flood Management:**

- **Q.** Explain how GIS can be utilized in Water Resources Management. **(WINTER 2022, 7 Marks; SUMMER 2023, 3 Marks OR; SUMMER 2024, 7 Marks OR)**
- **Q.** Explain the importance of GIS in water supply engineering / Discuss the application of GIS in water supply and distribution for urban city area. **(SUMMER 2023, 3 Marks; WINTER 2024, 4 Marks; WINTER 2025, 3 Marks)**
- **Q.** Applications of GIS in hydrology and flood forecasting/analysis/management / Write the functions of GIS in hydrological flood assessment / Describe the application of GIS in flood hazard management with suitable example. **(SUMMER 2023, 4 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 4 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 7 Marks)**

**3. Transportation and Urban Planning:**

- **Q.** Discuss the applications of GIS in transportation route assignment / traffic management / road traffic management / transportation and utility system. **(SUMMER 2022, 3 Marks; WINTER 2023, 3 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 4 Marks)**
- **Q.** Explain the role of GIS in urban planning. **(SUMMER 2022, 7 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 3 Marks)**

**4. Solid Waste, Soil and Land Use Applications:**

- **Q.** Explain how GIS may be useful in solid and hazardous management / Explain how GIS is beneficial over traditional practices in solid and hazardous waste management. **(SUMMER 2022, 4 Marks; SUMMER 2023, 7 Marks OR; SUMMER 2025, 4 Marks)**
- **Q.** Discuss the applications of GIS in soil erosion modelling / risk mapping / patterns in natural occurrences like soil erosion. **(SUMMER 2022, 7 Marks; WINTER 2024, 7 Marks; WINTER 2025, 3 Marks)**
- **Q.** Write a note on Land use/Land cover system in India / Explain the use of LULC maps in GIS softwares. **(SUMMER 2022, 4 Marks; SUMMER 2023, 7 Marks)**

### Other Important Questions:

**1. General Applications of GIS in Civil Engineering:**

- **Q.** List out various civil engineering project where GIS interface. **(WINTER 2023, 4 Marks)**
- **Q.** Elaborate the sentence “The growth of GIS has changed in the modern period of civil engineering project development”. **(WINTER 2023, 7 Marks OR)**

**2. Water Resources, Water Supply and Flood Management:**

- **Q.** What is the methodology that can be adopted for flood forecasting and early warning to the stakeholders using GIS? **(SUMMER 2025, 7 Marks)**

**3. Transportation and Urban Planning:**

- **Q.** Discuss how GIS can be useful to improve the traffic congestion and parking facilities in a metropolitan city. **(WINTER 2025, 7 Marks)**

**4. Solid Waste, Soil and Land Use Applications:**

- **Q.** Explain the usefulness of GIS in soil mapping. **(SUMMER 2023, 4 Marks)**

## Chapter 2 – Introduction to ArcGIS / QGIS Desktop GIS

### Repeated Questions:

**1. Introduction to GIS and GIS Software Packages:**

- **Q.** What is GIS? / Write a note on GIS. **(WINTER 2022, 3 Marks; SUMMER 2024, 3 Marks)**
- **Q.** List out open-source GIS software / List open-source software for GIS. **(WINTER 2022, 3 Marks; SUMMER 2024, 3 Marks)**
- **Q.** Compare the salient features of ArcGIS and QGIS / Write the differences of salient features of ArcGIS and QGIS. **(SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks)**

**2. ArcGIS Desktop and ArcGIS Online:**

- **Q.** Explain ArcGIS desktop / Discuss the features of ArcGIS. **(SUMMER 2022, 7 Marks OR; SUMMER 2024, 4 Marks OR)**

**3. QGIS Features and Tools:**

- **Q.** Write down full form of QGIS and Salient Feature of QGIS / What are the limitations of QGIS? **(WINTER 2022, 7 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 7 Marks OR)**
- **Q.** Explain the procedure of Georeferencing in QGIS / Explain the purpose of georeferencing in QGIS software / Explain the term: Geo-referencing / Define Geo-referencing and explain how to geo-reference a map using QGIS. **(SUMMER 2022, 3 Marks; WINTER 2022, 4 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 3 Marks; SUMMER 2025, 7 Marks)**

**4. Spatial Analysis Tools and Watershed Delineation:**

- **Q.** Enlist various spatial analyst tool commands used in ArcGIS / List various analytical tools used in QGIS software for delineation of watershed. **(SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 3 Marks)**

### Other Important Questions:

**1. Introduction to GIS and GIS Software Packages:**

- **Q.** Enlist various GIS software packages and explain one in detail. **(WINTER 2023, 4 Marks)**

**2. ArcGIS Desktop and ArcGIS Online:**

- **Q.** Explain various features and importance of ArcGIS online (AGOL). **(WINTER 2025, 7 Marks)**
- **Q.** Explain the concept of geoprocessing in ArcGIS. **(WINTER 2024, 3 Marks OR)**
- **Q.** Explain the concept of geocoding and reverse geocoding in ArcGIS. **(WINTER 2024, 7 Marks)**
- **Q.** Briefly describe the features of ESRI ArcScene environment. **(SUMMER 2022, 3 Marks)**
- **Q.** Explain the use of ArcSWAT tool used in ArcGIS software. **(SUMMER 2023, 7 Marks)**

**3. QGIS Features and Tools:**

- **Q.** Explain the process of Raster Mosaicking and Clipping in QGIS. **(SUMMER 2022, 3 Marks)**
- **Q.** List out the tools of QGIS used in vector data analysis. **(SUMMER 2025, 3 Marks)**
- **Q.** Explain the significance of vector data analysis in QGIS. **(WINTER 2025, 3 Marks)**

## Chapter 3 – GIS and data science

### Repeated Questions:

**1. Data Models and Data Structures:**

- **Q.** Differentiate between Raster data model and Vector data model / Describe the raster and vector data structures. What are the relative advantages and disadvantages of both data structures? / What is a geographic phenomenon? What is the difference between a Raster and Vector data? **(WINTER 2022, 7 Marks OR; SUMMER 2023, 4 Marks; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks OR)**
- **Q.** Explain various object-based data models / Distinguish between geo-relational data model and the object-based data model. **(SUMMER 2023, 3 Marks; WINTER 2024, 4 Marks)**

**2. Spatial and Attribute Data, Databases and Queries:**

- **Q.** What is difference between spatial and non spatial data / Difference between spatial and non spatial data operation? **(WINTER 2022, 4 Marks; WINTER 2023, 3 Marks OR; SUMMER 2024, 3 Marks OR)**
- **Q.** Explain linking of spatial and attribute data in GIS for Further analysis / Show how the spatial and attribute data is linked in GIS. **(WINTER 2022, 4 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 4 Marks)**
- **Q.** Define Cadastral maps, Topographical maps and Thematic maps / Define metadata, attribute data and spatial data. **(WINTER 2022, 3 Marks; WINTER 2022, 3 Marks OR; SUMMER 2024, 3 Marks)**
- **Q.** Write a short note on Database Management Systems / What do you mean by database? Explain Database Management System. **(SUMMER 2022, 4 Marks OR; SUMMER 2023, 4 Marks OR; WINTER 2025, 4 Marks OR)**

**3. GIS Data Sources and File Formats:**

- **Q.** List out various GIS spatial data sources from internet / Explain various data sources for GIS / List out agency which provides free GIS data on internet. **(SUMMER 2022, 4 Marks; WINTER 2022, 3 Marks OR; SUMMER 2023, 4 Marks; WINTER 2023, 4 Marks OR; SUMMER 2024, 4 Marks OR)**
- **Q.** Enlist various file formats of raster data / Discuss various raster and vector data file formats / What are the different file formats used to store Raster data and Vector data? **(SUMMER 2022, 3 Marks OR; WINTER 2022, 3 Marks; WINTER 2023, 4 Marks OR; WINTER 2025, 3 Marks OR)**

**4. Map Projections, Datums and Coordinate Systems:**

- **Q.** Give classification of map projection and explain cylindrical map projection in detail / Explain conical map projection with neat sketches. [Diagram required – refer to the original question paper] **(WINTER 2022, 7 Marks OR; SUMMER 2023, 3 Marks OR; SUMMER 2024, 7 Marks; WINTER 2025, 7 Marks)**
- **Q.** Define Datum. Give out difference between Horizontal & Vertical datum / Differentiate between horizontal co-ordinate systems and vertical co-ordinate systems in GIS. **(SUMMER 2025, 7 Marks; WINTER 2025, 3 Marks)**
- **Q.** Explain various co-ordinate systems in GIS / Explain the importance of coordinate systems and spatial references in ArcGIS / Explain in detail about Projection File and Predefined coordinate Systems with an example. **(SUMMER 2022, 7 Marks; WINTER 2024, 7 Marks; WINTER 2024, 7 Marks OR)**
- **Q.** What do you mean by transformation and Why it is required? / Write a note on methods of transformations used in GIS. **(WINTER 2022, 4 Marks OR; SUMMER 2023, 7 Marks)**

**5. Maps, Metadata, Data Quality and Errors:**

- **Q.** Explain various types of maps used in GIS / Describe the types of GIS maps. **(SUMMER 2023, 4 Marks OR; WINTER 2025, 3 Marks OR)**

- **Q.** Enlist all the types of data errors. Explain any three / Write a short note with sketch on "Types of Digitizing Errors in GIS" / Explain any two types of errors associated with spatial data analysis. [Diagram required – refer to the original question paper] **(WINTER 2022, 4 Marks OR; WINTER 2023, 4 Marks; SUMMER 2024, 7 Marks OR)**

**6. Spatial Analysis Operations:**

- **Q.** Explain Spatial overlay operator / List out the GIS analysis functions. Describe an overlay analysis. **(WINTER 2023, 7 Marks OR; SUMMER 2024, 4 Marks)**
- **Q.** Write short note on: Buffering and Neighbourhood / Explain the buffer in any feature class (Point, Line, and Polygon) and also explain its uses. **(WINTER 2022, 7 Marks; WINTER 2023, 7 Marks)**
- **Q.** What is geo spatial analysis? Explain network analysis in detail / Explain the steps involved in creating a network dataset and solving a routing problem. **(WINTER 2022, 7 Marks; WINTER 2024, 7 Marks OR)**
- **Q.** Describe various types of buffers of reclassification process. **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks OR)**

## Other Important Questions:

**1. Data Models and Data Structures:**

- **Q.** Explain coverage data structures of point, line and polygon. **(WINTER 2024, 4 Marks)**
- **Q.** List and explain elements of Raster Data Model. **(WINTER 2024, 4 Marks OR)**
- **Q.** Point out the topological consistency rules. **(WINTER 2024, 3 Marks)**
- **Q.** Show the regional quad tree method that divides raster into a hierarchy of quadrants. [Diagram required – refer to the original question paper] **(WINTER 2024, 7 Marks)**
- **Q.** What do you mean by raster data compression in GIS? **(SUMMER 2022, 3 Marks OR)**

**2. Spatial and Attribute Data, Databases and Queries:**

- **Q.** Write a note on non-spatial data operations. **(SUMMER 2022, 7 Marks)**
- **Q.** Describe various measurement levels of attribute data. **(WINTER 2025, 4 Marks OR)**
- **Q.** Explain various non-spatial database models. **(SUMMER 2022, 4 Marks OR)**
- **Q.** Explain the spatial and database queries in GIS. **(SUMMER 2025, 4 Marks)**
- **Q.** Give out methods of creating a Vector Map. **(WINTER 2025, 4 Marks)**

**3. GIS Data Sources and File Formats:**

- **Q.** Write a note on following GIS spatial data sources. (i) Natural Earth Data (ii) Open Topography. **(WINTER 2025, 7 Marks OR)**
- **Q.** Write a note on following GIS spatial data sources. (i) USGS earth explorer (ii) Open Street map. **(SUMMER 2025, 7 Marks OR)**

**4. Map Projections, Datums and Coordinate Systems:**

- **Q.** What is distortion? Which properties are changed due to distortions in Projections? What are the factors that determine the distortion? **(WINTER 2025, 4 Marks)**
- **Q.** Write a note on azimuthal projections. **(SUMMER 2025, 3 Marks)**
- **Q.** What is map scale? Describe the types of map scales. **(SUMMER 2025, 3 Marks OR)**

**5. Maps, Metadata, Data Quality and Errors:**

- **Q.** What do you understand by map? Differentiate between topographic and cadastral map. **(SUMMER 2022, 4 Marks OR)**
- **Q.** Explain Metadata styles and standards. **(SUMMER 2025, 4 Marks OR)**
- **Q.** Write a short note on data quality standards in GIS. **(WINTER 2024, 3 Marks OR)**

**6. Spatial Analysis Operations:**

- **Q.** Explain in detail the following: (1) Quadrant count analysis (2) nearest neighbour analysis. **(SUMMER 2023, 7 Marks OR)**
- **Q.** Explain the update and erase in feature manipulation. **(SUMMER 2025, 4 Marks)**

## Chapter 4 – GIS modeling approaches in project management

### Repeated Questions:

**1. Digital Elevation Models, TIN, DTM and DSM:**

- **Q.** Differentiate between DEM and TIN / Differentiate TIN and DEM / Differentiate between DTM and DEM. **(SUMMER 2022, 3 Marks; WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks OR; WINTER 2023, 3 Marks OR; SUMMER 2024, 4 Marks)**
- **Q.** Write the procedure of TIN analysis in GIS / Explain TIN analysis / Explain the main components of Triangular irregular networks (TIN) / Write short note on Triangulated irregular network / Explain the concept and features of Triangular irregular networks (TIN). **(WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; SUMMER 2024, 4 Marks; WINTER 2024, 4 Marks; SUMMER 2025, 4 Marks)**
- **Q.** Write a brief note on USGS DEMs / Write a note on: USGS DEMs. **(WINTER 2024, 3 Marks OR; WINTER 2025, 3 Marks OR)**
- **Q.** Explain the specific features of Digital Terrain models / Explain how the digital terrain model is analyzed in GIS. **(SUMMER 2023, 7 Marks OR; WINTER 2025, 4 Marks)**
- **Q.** Explain Digital Surface Models (DSM) / What do you mean by Digital surface model (DSM)? / Explain the difference between DEM and DSM. **(WINTER 2023, 3 Marks OR; WINTER 2024, 4 Marks OR; WINTER 2025, 4 Marks OR)**
- **Q.** Explain the use of digital elevation model / Discuss various Digital Elevation file formats. **(SUMMER 2022, 4 Marks OR; SUMMER 2025, 3 Marks OR)**
- **Q.** Write the process of downloading DEM in ArcGIS / Describe the process to obtain the DEM of the required topography. **(SUMMER 2023, 3 Marks OR; WINTER 2024, 4 Marks OR)**

**2. Terrain and Watershed Analysis:**

- **Q.** Briefly describe the procedure of watershed delineation in ArcSWAT / State various input datasets required for Terrain Modelling. Give process steps for watershed delineation / Briefly describe the procedure of watershed delineation in ArcMap. **(WINTER 2023, 7 Marks; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks OR)**

**3. GIS Modelling, Interpolation and Decision Making:**

- **Q.** Write a short note on spatial interpolation / What is spatial interpolation? Explain Global methods of interpolation. / Discuss the benefits of spatial filtering. **(WINTER 2024, 7 Marks OR; WINTER 2025, 4 Marks; WINTER 2025, 3 Marks)**
- **Q.** Explain use of GIS as decision making tool with example / Explain the criteria for decision making in GIS modelling / Write a note on decision making in GIS modelling. **(WINTER 2022, 4 Marks OR; SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks OR; SUMMER 2024, 4 Marks OR; WINTER 2024, 7 Marks)**
- **Q.** Explain the concept of dynamic visualization of GIS modelling / Write a note on dynamic visualization / Explain dynamic Visualization concept in GIS modelling. **(SUMMER 2022, 7 Marks OR; SUMMER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks)**

**4. GIS Output, Interfaces and Web-GIS:**

- **Q.** Write a note on GIS post-processing and output generation / What is GIS post processing? **(SUMMER 2022, 7 Marks OR; WINTER 2022, 3 Marks OR; SUMMER 2024, 7 Marks; WINTER 2024, 3 Marks)**
- **Q.** What is a GIS Interface? / Explain GIS interfaces / Write a short note on GIS interfaces. **(WINTER 2022, 3 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks OR; SUMMER 2025, 3 Marks)**

## Other Important Questions:

**1. Digital Elevation Models, TIN, DTM and DSM:**

- **Q.** Enlist the errors found in Digital Elevation Models. Explain how they can be removed. **(WINTER 2025, 7 Marks)**
- **Q.** Discuss the factors affecting DEM accuracy. **(WINTER 2025, 7 Marks OR)**

**2. Terrain and Watershed Analysis:**

- **Q.** How to carry out Terrain analysis using QGIS? **(WINTER 2022, 7 Marks OR)**

**3. GIS Modelling, Interpolation and Decision Making:**

- **Q.** What do you mean by modelling in GIS? **(SUMMER 2022, 3 Marks OR)**

**4. GIS Output, Interfaces and Web-GIS:**

- **Q.** Explain Map Design Controls in GIS output. **(SUMMER 2022, 4 Marks)**
- **Q.** Give the overview of web-GIS interface. **(SUMMER 2022, 4 Marks)**

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