(2½ Hours)   **[Total Marks: 75**

N. B.: (1) **All** questions are **compulsory.**
   (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
   (3) Answers to the **same question** must be **written together.**
   (4) Numbers to the **right** indicate **marks.**
   (5) Draw **neat labeled diagrams** wherever **necessary.**
   (6) Use of **Non-programmable** calculators is **allowed.**

1. Attempt *any three* of the following: 15
a. Write a short note on GIScience, GISystem and GIS application.
b. What is a Spatial Data and Spatial Analysis? Explain using suitable example.
c. Define Model. Explain how models help in representing real world in GIS.
d. Represent the given three valued raster using quad tree.
   F- Forest Land
   I-Industrial Area
   R- Residential Area

I	I	I	I	R	R	I	F
I	I	I	I	R	R	F	I
F	F	I	I	R	R	R	R
F	F	F	F	R	R	R	R
F	F	F	F	F	F	I	I
F	F	F	F	F	F	F	F
F	F	F	F	R	R	R	R
F	F	F	F	R	R	R	R

e. Explain the mathematical properties of geometric space used in spatial data using suitable diagram.
f. Define spatiotemporal data model. Explain the concept of representing time in GIS.

2. Attempt *any three* of the following: 15
a. Define GIS. Explain its range of capabilities to handle georeferenced data.
b. Explain the GIS Architecture and functionality using suitable diagram.
c. Differentiate between Vector and Raster data representation.
d. What are the reasons for using DBMS in GIS? Explain any five
e. Write a short note on the Relational Data Model
f. Explain the process of linking GIS and DBMS.

3. Attempt *any three* of the following: 15
a. Explain the reference surface for mapping the Earth's surface.
b. Explain the 2D geographic coordinate system.
c. How Map projections are classified? Explain.
d. Explain the working of GPS.
e. Write a short note on vectorization.
f. What is Interpolation? Explain interpolation of continuous Data.

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4. Attempt *any three* of the following: 15
a   What are Neighborhood functions in GIS? Explain any four.
b   Write a short note on vector overlay operation.
c   Explain the two main techniques of determining Automatic classification.
d   Perform the raster overlay operation to project Ground Water Level Raster in 2025
    $R2 = con(R1 > 5 , \mathbf{R1 - 5} , 0)$

R1 – Ground Water Level Raster in 2023

7	8	5	4	3	3
6	4	12	5	4	4
7	10	12	8	7	4
4	8	9	8	7	4
1	1	0	3	0	0
1	0	0	7	0	0

e   Write a short note on Network Analysis.
f   How Error Propagates in GIS? Explain using suitable diagram.

5. Attempt *any three* of the following: 15
a.   Explain using suitable diagram the Visualization strategy.
b.   Define the following terms:
    i.   Symbology
    ii.   Cartography
    iii.   Map Legend
    iv.   Pixel
    v.   Voxel
c.   Explain the statement "How do I say what to whom, and is it effective?" with reference to map in GIS.
d.   List and explain Bertin's six categories of Visual Variables.
e.   How to map time series? Explain using suitable example.
f.   Write a short note on map dissemination.