Seat No   **Max. Marks: 50**

1	Create a map of your own residential area
	    1. Add 4 Area (id, name)
	    2. Add 4 Garden (id, name)
	    3. Add 2 Highways (id, name)
	    4. Add 2 railway track (id, name, line)
	    5. Add 5 Railway stations(id, name, line)
	    6. Add 5 Restaurants (id, name) [At least 2 should be inside any garden]
	    7. Add 5 Hospitals
	    8. Add 10 Building / residential compound / Business Park.
		25

2	Perform the following queries on above layers 1. Add a new column Garden_area and calculate the area of each garden 2. Show the largest garden. 3. Show all the railway tracks that intersect with Highways. 4. Find all the restaurants inside a garden. 5. Find all the railway tracks that do not intersects with highway	15
3	Viva	5
4	Journal	5

Step 1: Define the Residential Area Map Structure
To create a map of a residential area, we'll define the structure for each entity:
- **Area: id, name**
- **Garden: id, name**
- **Highway: id, name**
- **Railway Track: id, name, line**
- **Railway Station: id, name, line**
- **Restaurant: id, name, location (some inside gardens)**
- **Hospital: id, name**
- **Building/Residential Compound/Business Park: id, name**

Step 2: Add Areas
1. Area 1: id = 1, name = "Green Valley"
2. Area 2: id = 2, name = "Sunny Heights"
3. Area 3: id = 3, name = "River View"
4. Area 4: id = 4, name = "Central Park"

Step 3: Add Gardens
1. Garden 1: id = 1, name = "Rose Garden" (located in Area 1)
2. Garden 2: id = 2, name = "Lily Park" (located in Area 2)
3. Garden 3: id = 3, name = "Sunflower Garden" (located in Area 3)
4. Garden 4: id = 4, name = "Central Park Garden" (located in Area 4)

Step 4: Add Highways
1. Highway 1: id = 1, name = "North-South Highway"

2. Highway 2: id = 2, name = "East-West Expressway"

Step 5: Add Railway Tracks
1. Railway Track 1: id = 1, name = "Main Line Track", line = "Red Line"
2. Railway Track 2: id = 2, name = "Branch Line Track", line = "Blue Line"

Step 6: Add Railway Stations
1. Station 1: id = 1, name = "Central Station", line = "Red Line"
2. Station 2: id = 2, name = "Green Valley Station", line = "Red Line"
3. Station 3: id = 3, name = "Sunny Heights Station", line = "Blue Line"
4. Station 4: id = 4, name = "River View Station", line = "Blue Line"
5. Station 5: id = 5, name = "Park Station", line = "Red Line"

Step 7: Add Restaurants
1. Restaurant 1: id = 1, name = "Tasty Bites" (located in Area 1)
2. Restaurant 2: id = 2, name = "Garden Cafe" (located in Garden 1 - Rose Garden)
3. Restaurant 3: id = 3, name = "Sunny Eats" (located in Area 2)
4. Restaurant 4: id = 4, name = "Parkview Restaurant" (located in Garden 4 - Central Park Garden)
5. Restaurant 5: id = 5, name = "River Delights" (located in Area 3)

Step 8: Add Hospitals
1. Hospital 1: id = 1, name = "Green Valley Hospital" (located in Area 1)
2. Hospital 2: id = 2, name = "Sunny Heights Medical Center" (located in Area 2)
3. Hospital 3: id = 3, name = "River View Hospital" (located in Area 3)
4. Hospital 4: id = 4, name = "Central Park Clinic" (located in Area 4)
5. Hospital 5: id = 5, name = "City General Hospital" (located near Highway 1)

Step 9: Add Buildings/Residential Compounds/Business Parks
1. Building 1: id = 1, name = "Green Valley Apartments" (located in Area 1)
2. Building 2: id = 2, name = "Sunny Heights Towers" (located in Area 2)
3. Building 3: id = 3, name = "River View Residences" (located in Area 3)
4. Building 4: id = 4, name = "Central Park Business Park" (located in Area 4)
5. Building 5: id = 5, name = "Northside Business Hub" (located near Highway 1)
6. Building 6: id = 6, name = "Southside Residential Complex" (located near Highway 2)
7. Building 7: id = 7, name = "Eastside Apartments" (located in Area 2)
8. Building 8: id = 8, name = "Westside Business Park" (located in Area 3)
9. Building 9

Step 1: Add a new column Garden_area and calculate the area of each garden
To add a new column "Garden_area" and calculate the area of each garden, we'll assume we have the garden boundaries in a spatial format (e.g., polygon coordinates). We'll use a SQL query with spatial functions.

```
ALTER TABLE Gardens ADD COLUMN Garden_area FLOAT;

UPDATE Gardens
```

SET Garden_area = ST_Area(geom); // assuming 'geom' is the spatial column
```

**Step 2: Show the largest garden**
To show the largest garden, we can use a SQL query with an ORDER BY clause.

```
SELECT *
FROM Gardens
ORDER BY Garden_area DESC
LIMIT 1;
```

Step 3: Show all the railway tracks that intersect with Highways
To find the railway tracks that intersect with highways, we'll use a SQL query with a spatial join.

```
SELECT rt.*
FROM Railway_Tracks rt
JOIN Highways h ON ST_Intersects(rt.geom, h.geom);
```

Step 4: Find all the restaurants inside a garden
To find the restaurants inside a garden, we'll use a SQL query with a spatial join.

```
SELECT r.*
FROM Restaurants r
JOIN Gardens g ON ST_Contains(g.geom, r.geom);
```

Step 5: Find all the railway tracks that do not intersect with highway
To find the railway tracks that do not intersect with highways, we'll use a SQL query with a spatial join and a NOT IN clause.

```
SELECT rt.*
FROM Railway_Tracks rt
WHERE rt.id NOT IN (
  SELECT rt.id
  FROM Railway_Tracks rt
  JOIN Highways h ON ST_Intersects(rt.geom, h.geom)
);
```

Alternatively, we can use a LEFT JOIN and check for NULL values.

```

```
SELECT rt.*
FROM Railway_Tracks rt
LEFT JOIN Highways h ON ST_Intersects(rt.geom, h.geom)
WHERE h.id IS NULL;
```

UNIVERSITY OF MUMBAI
T.Y. B. Sc. INFORMATION TECHNOLOGY (Semester VI) (PRACTICAL EXAMINATION)
Fundamentals of Geographic Information System

Seat No   **Max. Marks: 50**

1	Create a map of your own residential area	25
	1. Add 4 Area (id, name)	
	2. Add 4 Garden (id, name)	
	3. Add 2 Highways (id, name)	
	4. Add 2 railway track (id, name, line)	
	5. Add 5 Railway stations (id, name, line)	
	6. Add 5 Restaurants (id, name) [At least 2 should be inside any garden]	
	7. Add 5 Hospitals	
	8. Add 10 Building / residential compound / Business.	
2	Create a Map using above layers	15
	Add the following	
	1. Add a North Pointer	
	2. Add Legend and Scale	
	3. Use "any "Symbol to indicate hospitals.	
	4. Use a symbol indicating Metro station for one of the railway stations.	
	5. Save your map in JPEG format with 1500 dpi of resolution.	
3	Viva	5
4	Journal	5

Step 1: Define the Residential Area Map Structure
To create a map of a residential area, we'll define the structure for each entity:
- Area: id, name
- Garden: id, name
- Highway: id, name
- Railway Track: id, name, line
- Railway Station: id, name, line
- Restaurant: id, name, location (some inside gardens)
- Hospital: id, name
- Building/Residential Compound/Business Park: id, name

Step 2: Add Areas
1. Area 1: id = 1, name = "Green Valley"
2. Area 2: id = 2, name = "Sunny Heights"
3. Area 3: id = 3, name = "River View"
4. Area 4: id = 4, name = "Central Park"

Step 3: Add Gardens
1. Garden 1: id = 1, name = "Rose Garden" (located in Area 1)
2. Garden 2: id = 2, name = "Lily Park" (located in Area 2)
3. Garden 3: id = 3, name = "Sunflower Garden" (located in Area 3)
4. Garden 4: id = 4, name = "Central Park Garden" (located in Area 4)

Step 4: Add Highways
1. Highway 1: id = 1, name = "North-South Highway"
2. Highway 2: id = 2, name = "East-West Expressway"

Step 5: Add Railway Tracks
1. Railway Track 1: id = 1, name = "Main Line Track", line = "Red Line"
2. Railway Track 2: id = 2, name = "Branch Line Track", line = "Blue Line"

Step 6: Add Railway Stations
1. Station 1: id = 1, name = "Central Station", line = "Red Line"
2. Station 2: id = 2, name = "Green Valley Station", line = "Red Line"
3. Station 3: id = 3, name = "Sunny Heights Station", line = "Blue Line"
4. Station 4: id = 4, name = "River View Station", line = "Blue Line"
5. Station 5: id = 5, name = "Park Station", line = "Red Line"

Step 7: Add Restaurants
1. Restaurant 1: id = 1, name = "Tasty Bites" (located in Area 1)
2. Restaurant 2: id = 2, name = "Garden Cafe" (located in Garden 1 - Rose Garden)
3. Restaurant 3: id = 3, name = "Sunny Eats" (located in Area 2)
4. Restaurant 4: id = 4, name = "Parkview Restaurant" (located in Garden 4 - Central Park Garden)
5. Restaurant 5: id = 5, name = "River Delights" (located in Area 3)

Step 8: Add Hospitals
1. Hospital 1: id = 1, name = "Green Valley Hospital" (located in Area 1)
2. Hospital 2: id = 2, name = "Sunny Heights Medical Center" (located in Area 2)
3. Hospital 3: id = 3, name = "River View Hospital" (located in Area 3)
4. Hospital 4: id = 4, name = "Central Park Clinic" (located in Area 4)
5. Hospital 5: id = 5, name = "City General Hospital" (located near Highway 1)

Step 9: Add Buildings/Residential Compounds/Business Parks
1. Building 1: id = 1, name = "Green Valley Apartments" (located in Area 1)
2. Building 2: id = 2, name = "Sunny Heights Towers" (located in Area 2)
3. Building 3: id = 3, name = "River View Residences" (located in Area 3)
4. Building 4: id = 4, name = "Central Park Business Park" (located in Area 4)
5. Building 5: id = 5, name = "Northside Business Hub" (located near Highway 1)
6. Building 6: id = 6, name = "Southside Residential Complex" (located near Highway 2)
7. Building 7: id = 7, name = "Eastside Apartments" (located in Area 2)
8. Building 8: id = 8, name = "Westside Business Park" (located in Area 3)
9. Building 9

Step 1: Create a Map using above layers
To create a map, we'll use a Geographic Information System (GIS) software like QGIS or ArcGIS. We'll add the following layers:

1. Areas
2. Gardens
3. Highways
4. Railway Tracks
5. Railway Stations
6. Restaurants
7. Hospitals
8. Buildings/Residential Compounds/Business Parks

Step 2: Add a North Pointer
To add a north pointer, we'll use the GIS software's built-in tools.

1. In QGIS, go to "View" > "Decorations" > "North Arrow"

2. In ArcGIS, go to "Insert" > "North Arrow"

Step 3: Add Legend and Scale
To add a legend and scale, we'll use the GIS software's built-in tools.

1. In QGIS, go to "View" > "Legend" and customize the legend
2. In ArcGIS, go to "Insert" > "Legend" and customize the legend
3. For scale, go to "View" > "Scale Bar" in QGIS or "Insert" > "Scale Bar" in ArcGIS

Step 4: Use a symbol to indicate hospitals
To use a symbol to indicate hospitals, we'll customize the hospital layer's symbology.

1. In QGIS, go to "Layer Properties" > "Symbology" and choose a symbol (e.g., a red cross)
2. In ArcGIS, go to "Layer Properties" > "Symbology" and choose a symbol (e.g., a red cross)

Step 5: Use a symbol indicating Metro station for one of the railway stations
To use a symbol indicating a metro station for one of the railway stations, we'll customize the railway station layer's symbology.

1. In QGIS, go to "Layer Properties" > "Symbology" and choose a symbol (e.g., a metro icon) for the specific station
2. In ArcGIS, go to "Layer Properties" > "Symbology" and choose a symbol (e.g., a metro icon) for the specific station

Step 6: Save the map in JPEG format with 1500 dpi resolution
To save the map in JPEG format with 1500 dpi resolution, we'll use the GIS software's export tools.

1. In QGIS, go to "Project" > "Export" > "Export Map as Image" and choose JPEG format with 1500 dpi resolution
2. In ArcGIS, go to "File" > "Export Map" and choose JPEG format with 1500 dpi resolution

Note: The exact steps may vary depending on the GIS software version and configuration.

Seat No   **Max. Marks: 50**

1	Create a map based on following assumptions 1. Add 1 Highways (id= "375") 2. Add 6 Farms (id, own_name) (2 farms near Highway) 3. Add 4 narrow Paths between farms (id) 4. Add a main road that passes near farms and touches the highway. 5. Add 2 Farm houses in any two farms (id, frm_id). 6. Add 4 Residential areas. (at-least one near farm and one near main road) 7. Add two Primary Schools 8. Add a Bus stop and an Auto Stand near a main road. 9. Add a Grampanchayat office 10. Add 4 wells (3 in farms and 1 in residential area)	25
2	Perform the following queries on above layers 1. Show all the farms that contains well. 2. Calculate area of each farm and Show the largest farm. 3. Show all the paths that intersect with Highways.	15
3	Viva	5
4	Journal	5

Step 1: Add Highway
- **Create a new layer for the highway**
- **Add a single feature with id = "375"**

Step 2: Add Farms
- **Create a new layer for farms**
- **Add 6 farm features with id and own_name attributes**
- **Place 2 farms near the highway**

Step 3: Add Narrow Paths
- **Create a new layer for paths**
- **Add 4 path features with id attributes**
- **Place paths between farms**

Step 4: Add Main Road
- **Create a new layer for the main road**
- **Add a single feature that passes near farms and touches the highway**

Step 5: Add Farm Houses
- **Create a new layer for farm houses**
- **Add 2 farm house features with id and frm_id attributes**
- **Place farm houses in 2 farms**

Step 6: Add Residential Areas

- Create a new layer for residential areas
- Add 4 residential area features
- Place at least one residential area near a farm and one near the main road

Step 7: Add Primary Schools
- Create a new layer for primary schools
- Add 2 school features

Step 8: Add Bus Stop and Auto Stand
- Create new layers for bus stop and auto stand
- Add single features for bus stop and auto stand near the main road

Step 9: Add Grampanchayat Office
- Create a new layer for the Grampanchayat office
- Add a single feature

Step 10: Add Wells
- Create a new layer for wells
- Add 4 well features
- Place 3 wells in farms and 1 well in a residential area

The map is now created with all the required features.

Step 1: Show all the farms that contain a well
- Open the attribute table of the Farms layer
- Use a spatial join or query to select farms that contain a well
- Query: `SELECT * FROM Farms WHERE id IN (SELECT frm_id FROM Wells WHERE location = 'Farm')`

Step 2: Calculate area of each farm and show the largest farm
- Open the attribute table of the Farms layer
- Use a spatial function to calculate the area of each farm
- Query: `SELECT id, own_name, ST_Area(geom) AS farm_area FROM Farms ORDER BY farm_area DESC LIMIT 1`

Step 3: Show all the paths that intersect with Highways
- Open the attribute table of the Paths layer
- Use a spatial join or query to select paths that intersect with the highway
- Query: `SELECT * FROM Paths WHERE ST_Intersects(geom, (SELECT geom FROM Highway WHERE id = '375'))`

These queries will provide the desired results. Note that the exact syntax may vary depending on the GIS software or database being used.

1	Create a map of Railway route CST to Chembur including the building adjacent rails. Use any 7 layers and show stations.	25
2	Create dataset for all layers.	15
3	Viva	5
4	Journal	5

Step 1: Create 7 layers
1. Railway Route (line layer)
2. Stations (point layer)
3. Buildings (polygon layer)
4. Roads (line layer)
5. Land use (polygon layer)
6. Railway Tracks (line layer)
7. Adjacent Areas (polygon layer)

Step 2: Digitize Railway Route
- Create a line feature for the railway route from CST to Chembur

Step 3: Add Stations
- Create point features for stations along the route (e.g., CST, Dadar, Kurla, Chembur)

Step 4: Add Buildings
- Create polygon features for buildings adjacent to the railway route

Step 5: Add other layers
- Digitize roads, land use, railway tracks, and adjacent areas

Step 6: Style and label layers
- Apply suitable styles and labels to each layer

Step 7: Visualize the map
- View the map to ensure it is clear and readable

The map will show the railway route from CST to Chembur, including stations and adjacent buildings. Other layers will provide additional context.

Some possible attributes for each layer:

1. Railway Route: route_name, start_station, end_station
2. Stations: station_name, route_id
3. Buildings: building_name, address
4. Roads: road_name, road_type
5. Land use: land_use_type
6. Railway Tracks: track_id, route_id
7. Adjacent Areas: area_name, land_use_type

This map can be used for urban planning, transportation planning, or other purposes.

Step 1: Create dataset for Railway Route layer

id	route_name	start_station	end_station
1	CST-Chembur	CST	Chembur

Step 2: Create dataset for Stations layer

id	station_name	route_id
1	CST	1
2	Dadar	1
3	Kurla	1
4	Chembur	1

Step 3: Create dataset for Buildings layer

id	building_name	address
1	Building A	Near CST
2	Building B	Near Dadar
3	Building C	Near Kurla
4	Building D	Near Chembur

Step 4: Create dataset for Roads layer

id	road_name	road_type
1	Main Road	Highway
2	Local Road	Street

Step 5: Create dataset for Land use layer

id	land_use_type	area
1	Residential	100 acres
2	Commercial	50 acres
3	Industrial	200 acres

Step 6: Create dataset for Railway Tracks layer

id	track_id	route_id
1	Track 1	1
2	Track 2	1

Step 7: Create dataset for Adjacent Areas layer

id	area_name	land_use_type
1	Area 1	Residential
2	Area 2	Commercial

These datasets provide a basic structure for each layer. The actual data will depend on the specific requirements and details of the railway route and surrounding areas.

Seat No   **Max. Marks: 50**

1	Create a 3-vector layer to store points representing locations: college, restaurant, hospitals. 1. Add roads and railway tracks. 2. Change the color and size of point markers on vector layer to visually differentiate between categories of restaurants.	25
2	1. create a map from above layers: add label, legend, scale, Add a suitable title with proper formatting.	15
3	Viva	5
4	Journal	5

Step 1: Create a new project in QGIS

- **Open QGIS and create a new project**

- **Set the coordinate reference system (CRS) to a suitable projection (e.g., WGS 84 / UTM zone 43N)**

Step 2: Create a vector layer for points

- **Create a new point layer for locations (college, restaurant, hospitals)**

- **Add attributes: id, name, category (e.g., college, restaurant, hospital)**

Step 3: Add points to the layer

- **Add point features for colleges, restaurants, and hospitals**

- **Enter attributes for each point (e.g., name, category)**

Step 4: Create vector layers for roads and railway tracks

- **Create new line layers for roads and railway tracks**

- **Add attributes: id, name, type (e.g., road type, railway track type)**

- **Digitize roads and railway tracks**

Step 5: Style point markers

- **Open the layer properties for the points layer**

- **Go to the "Symbology" tab**

- **Choose "Categorized" symbology**

- **Select the "category" attribute as the categorization field**

- Apply different colors and sizes to each category (e.g., restaurants)

Step 6: Apply styles to roads and railway tracks

- Open the layer properties for the roads and railway tracks layers

- Go to the "Symbology" tab

- Choose a suitable style (e.g., line color, width)

Step 7: Visualize the map

- View the map to ensure it is clear and readable

- Adjust styles and labels as needed

Some possible attributes for each layer:

Points layer:

id	name	category
1	College A	college
2	Restaurant B	restaurant
3	Hospital C	hospital

Roads layer:

id	name	type
1	Main Road	highway
2	Local Road	street

Railway Tracks layer:

id	name	type
1	Railway Track 1	main line

This map can be used for urban planning, transportation planning, or other purposes.

Step 1: Add a suitable title

- Go to "Layout" > "Add Item" > "Add Label"

- Enter the title text (e.g., "Map of Locations")

- Format the title (e.g., font size, style, alignment)

Step 2: Add labels to layers

- Open the layer properties for each layer

- Go to the "Labels" tab

- Enable labels and choose the attribute to label (e.g., name)

- Format the labels (e.g., font size, style, color)

Step 3: Add a legend

- Go to "Layout" > "Add Item" > "Add Legend"

- Select the layers to include in the legend

- Format the legend (e.g., title, font size, style)

Step 4: Add a scale bar

- Go to "Layout" > "Add Item" > "Add Scale Bar"

- Choose the scale bar style and units (e.g., metric, imperial)

- Format the scale bar (e.g., size, color)

Step 5: Finalize the map

- Adjust the layout and formatting as needed

- Ensure the map is clear and readable

- Export the map as an image or PDF

The final map should include:

- A suitable title with proper formatting

- Labels for each layer (e.g., point names, road names)

- A legend that explains the symbols and colors used

- A scale bar that indicates the map scale

This map can be used for various purposes, such as urban planning, navigation, or visualization.

UNIVERSITY OF MUMBAI

T.Y. B. Sc. INFORMATION TECHNOLOGY (Semester VI) (PRACTICAL EXAMINATION)

Fundamentals of Geographic Information System

Seat No   **Max. Marks: 50**

1	Create vector layer for your residential layer. Add required data to demonstrate the join attribute by location.	25
2	To show the count points in polygon by using analysis tools.	15
3	Viva	5
4	Journal	5

UNIVERSITY OF MUMBAI

T.Y. B. Sc. INFORMATION TECHNOLOGY (Semester VI) (PRACTICAL EXAMINATION)

Fundamentals of Geographic Information System

Seat No   **Max. Marks: 50**

1	Create vector data. (add minimum 5 layers) 1. Line 2. Polygon 3. Add point object Prepare appropriate database.	30
2	Demonstrate the use of analytical tools distance matrix, points in layer.	10
4	Viva	5
5	Journal	5