Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Empowered Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
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Department of Computer Science & Engineering (IOT)

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session 2025-2026

Vision: Dream of where you want.	**Mission:** Means to achieve Vision

Program Educational Objectives of the program (PEO): (broad statements that describe the professional and career accomplishments)

PEO1	**Preparation**	**P: Preparation**	**Pep-CL abbreviation pronounce as Pep-si-lL easy to recall**
PEO2	**Core Competence**	**E: Environment (Learning Environment)**	
PEO3	**Breadth**	**P: Professionalism**	
PEO4	**Professionalism**	**C: Core Competence**	
PEO5	**Learning Environment**	**L: Breadth (Learning in diverse areas)**	

Program Outcomes (PO): (statements that describe what a student should be able to do and know by the end of a program)

Keywords of POs:
Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

PSO Keywords: Cutting edge technologies, Research

"I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life." *to contribute to the development of cutting-edge technologies and Research*.

Integrity: I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

Name and Signature of Student and Date
Bhushan Tayade
28-10-2025

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Session	**2025-26 (ODD)**	**Course Name**	**PE-I - Geo-Intelligence for Smart IoT Devices Lab**
Semester	**5**	**Course Code**	**23IOT1523**
Roll No	**035**	**Name of Student**	**Bhushan V. Tayade**

Practical Number	8
Course Outcome	Apply and demonstrate the use of proprietary and open-source GIS tools (e.g., QGIS) for creating, visualizing, and managing spatial datasets.
Aim	Implement Geo-processing Tools(Clip, Buffer, Difference, Union, Intersection and Dissolve) on various vector data by using model building in QGIS.
Problem Definition	Geo-processing tools are fundamental operations in Geographic Information Systems (GIS) used to analyze, manipulate, and transform spatial (vector) data. These operations take an input dataset (feature class or layer) and apply a geometric or attribute-based rule to create a new output dataset.
Theory (100 words)	The Graphical Modeler in QGIS allows users to design and automate a sequence of geo-processing operations through a visual, drag-and-drop interface. Instead of running tools one by one, users can connect multiple algorithms, such as Clip, Buffer, Difference, Union, Intersection, and Dissolve, into a single workflow model. This process not only saves time but also ensures accuracy and consistency across repeated analyses. The Model Builder supports the use of input parameters and outputs that can be easily customized for different datasets. By applying these tools on vector data (e.g., India's State and Country shapefiles), spatial relationships can be explored efficiently to produce multiple processed layers in one automated run.
Procedure and Execution	Implementation Steps: 1. Open QGIS: Launch QGIS software on your computer.

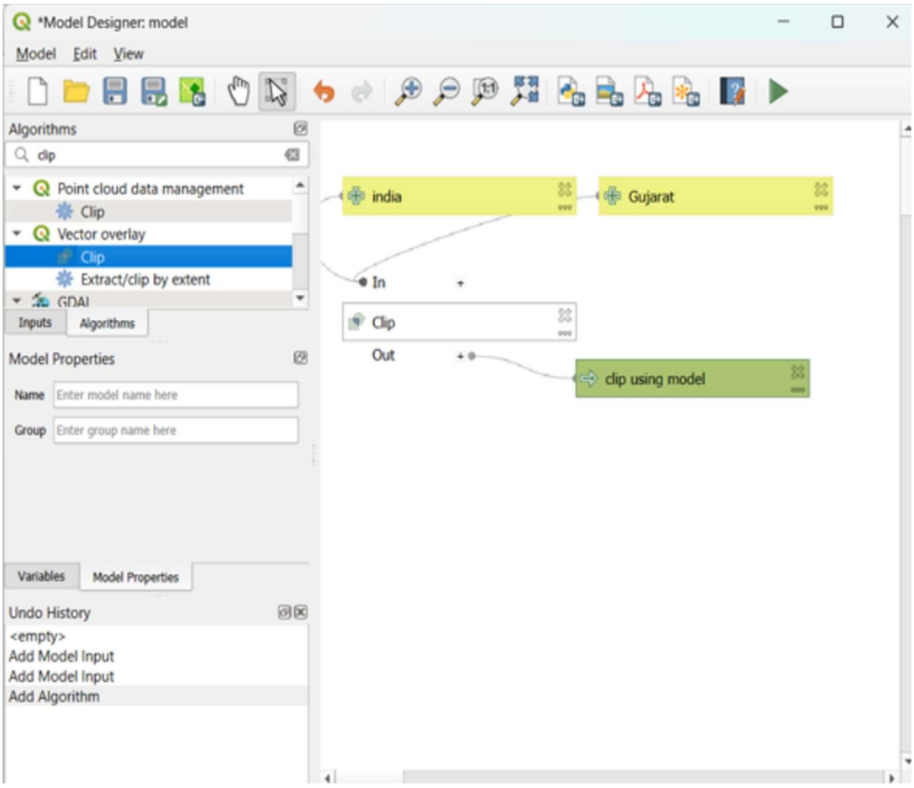
(100 Words)	2. Access Graphical Modeler: Navigate to Processing → Graphical Modeler and click New Model. Name the model as India_Geoprocessing_Model. 3. Add Input Layers: • In the left Inputs panel, drag and drop: • Vector Layer – India_States • Vector Layer – India_Country These will act as input datasets for the model. 4. Add Geoprocessing Algorithms: From the Algorithms panel, drag and connect the following tools: • Clip Tool (Vector Overlay → Clip) o Input: India_States o Overlay: India_Country o Output: Clipped_States • Buffer Tool (Vector Geometry → Buffer) o Input: India_Country o Distance: 100 km o Output: Country_Buffer • Difference Tool (Vector Overlay → Difference) o Input: India_Country o Overlay: India_States o Output: Country_Diff • Union Tool (Vector Overlay → Union) o Input Layers: India_Country + India_States o Output: Union_Layer • Intersection Tool (Vector Overlay → Intersection) o Input Layers: India_Country + India_States o Output: Intersect_Layer • Dissolve Tool (Vector Geometry → Dissolve) o Input: India_States o Field: COUNTRY_NAME o Output: India_Dissolved 5. Connect Tools: Link the inputs and outputs correctly between tools. Add all final layers to the Model Outputs list for display. 6. Save the Model:

Save it as India_GeoTools_Model.model3 in your QGIS models folder.

7. Run the Model:
   - Open Processing Toolbox → Models → India_GeoTools_Model.
   - Double-click to execute it.
   - Select the input shapefiles (India_States.shp and India_Country.shp).
   - Run the model to generate all processed outputs.

8. Visualize and Analyze Results:
   All resulting layers—Clipped, Buffered, Union, Intersection, and Dissolved—will appear in the Layers Panel, ready for styling, labeling, and spatial analysis.

Stepwise Screenshots with steps:



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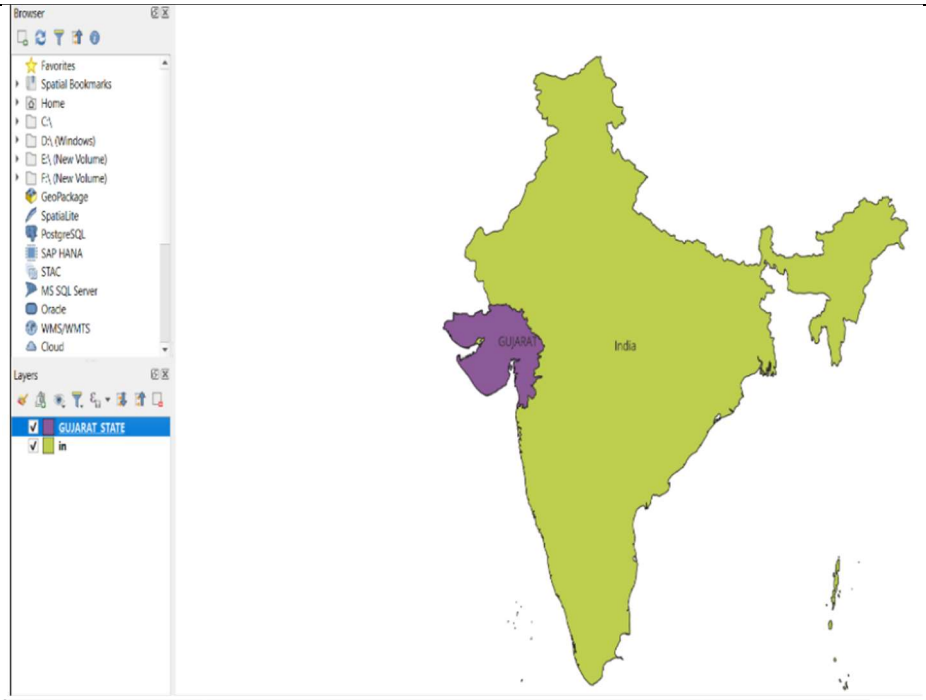

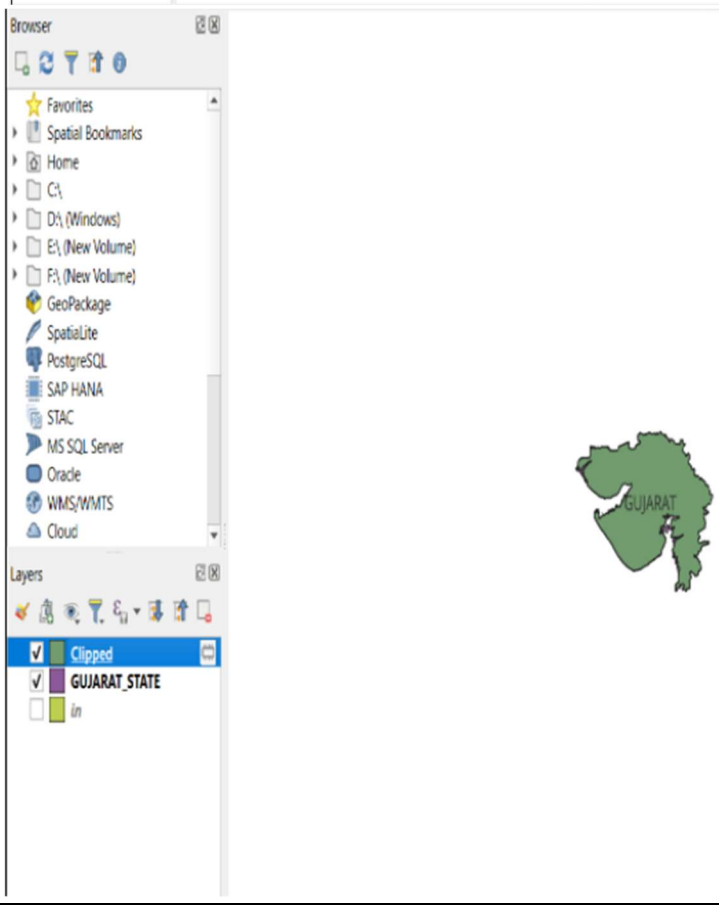

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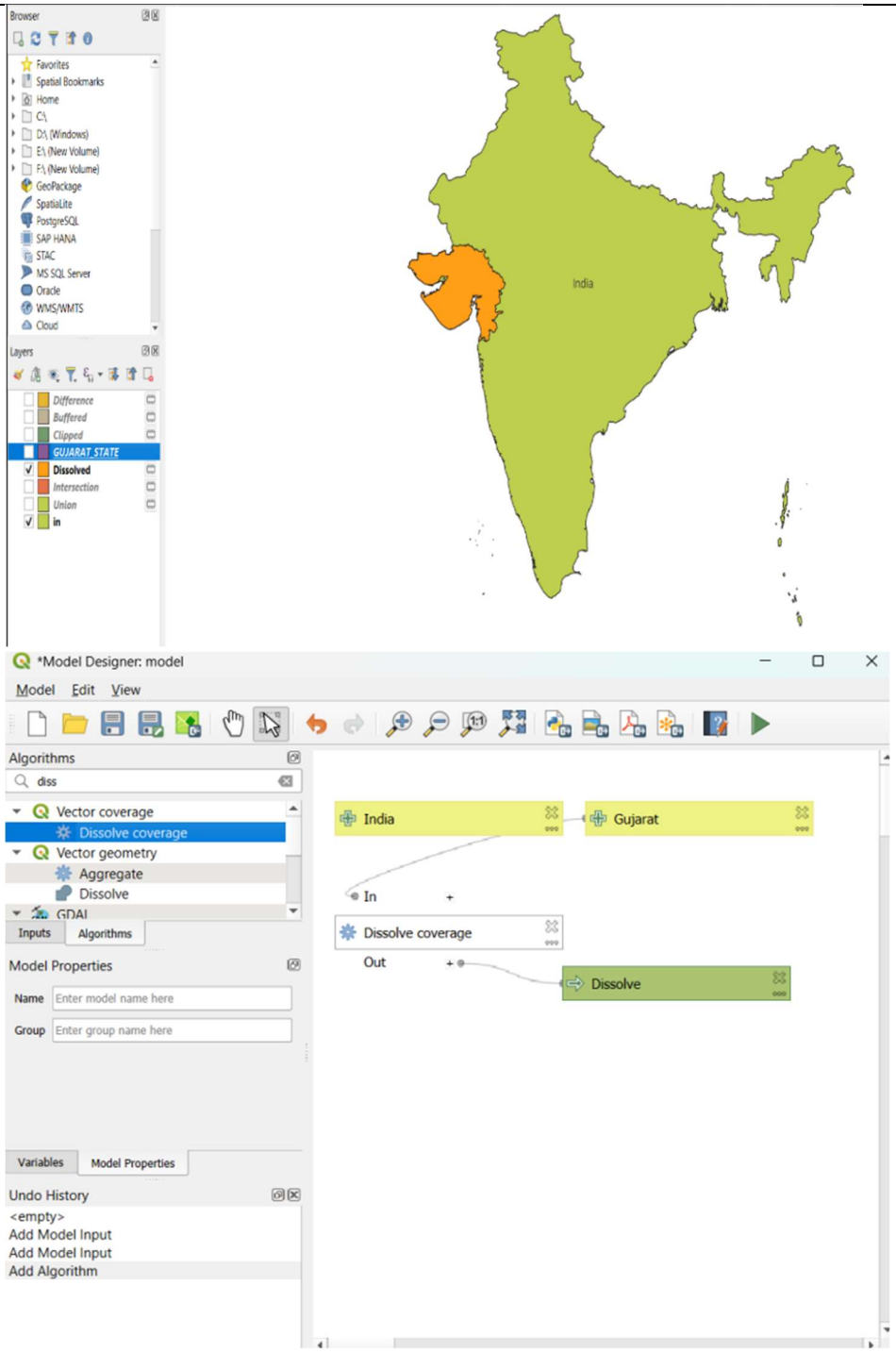
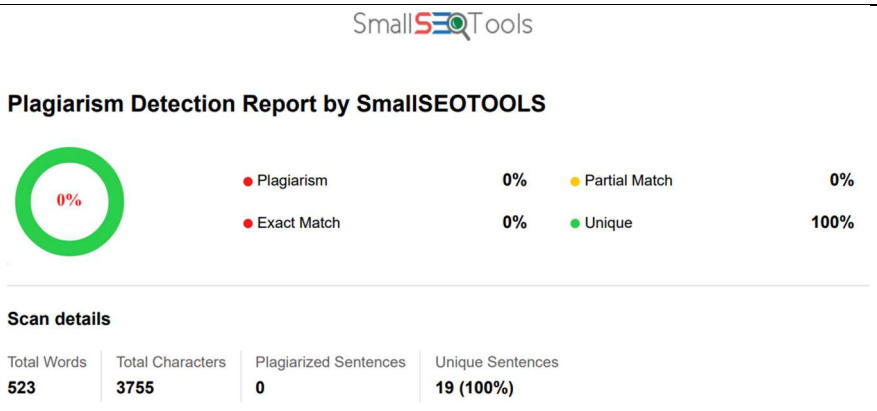
	
Output Analysis	After implementing the geo-processing tools — Clip, Buffer, Difference, Union, Intersection, and Dissolve — on the India_States and India_Country vector layers, multiple meaningful spatial outputs were successfully generated in QGIS.

	The Clip tool extracted only the state boundaries within the national boundary, while the Buffer tool created a 100 km zone around the India boundary, useful for proximity analysis. The Difference tool removed overlapping areas between the two layers, and the Union tool combined both datasets into a single comprehensive layer. The Intersection tool displayed only the overlapping regions of states and the country boundary, and the Dissolve tool merged state polygons based on the COUNTRY_NAME attribute to form a unified national boundary. Each operation executed successfully, producing accurate results that clearly demonstrate the power and versatility of geoprocessing tools in spatial data analysis and map-based decision making.
Link of student GitHub profile where lab assignment has been uploaded	"https://github.com/Bhushan-Tayade/YCCN-23071391.git"
Conclusion	In this practical, various geo-processing tools — Clip, Buffer, Difference, Union, Intersection, and Dissolve — were successfully implemented on India's vector datasets (State and Country shapefiles) using QGIS. Each tool was applied through the geospatial processing toolbox to perform spatial analysis and data manipulation. The outputs generated from these operations accurately demonstrated how different layers can be combined, compared, and refined to extract meaningful geographic information. Overall, the exercise provided practical insight into the use of geo-processing tools for analyzing spatial relationships, improving map accuracy, and supporting geospatial decision-making in GIS.
Plag Report (Similarity index <= 12%)	
Date	28-10-2025