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
12-08-2025

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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	3
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	Create a GeoPackage or shapefiles and digitize point/line/polygon features on QGIS interface.
Problem Definition	The task requires creating a GeoPackage or shapefile in QGIS and digitizing point, line, and polygon features using the software's editing tools.
Theory (100 words)	In QGIS, spatial data layers can be generated using file formats such as GeoPackage (.gpkg) and Shapefile (.shp). These formats are designed to store vector-based information, including points, lines, and polygons, which serve as digital representations of real-world geographical entities. Among these, the GeoPackage format is a more advanced and versatile standard, capable of containing multiple datasets or layers within a single file, along with support for larger data volumes and better performance. In contrast, the Shapefile format, while widely used and simple to manage, has certain limitations, such as restricted attribute lengths and the requirement for multiple files to represent a single dataset. The digitization process in QGIS involves creating a new vector layer with a pre-defined geometry type, either point, line, or polygon—based on the nature of the features to be represented. Once the layer is created, the user switches to edit mode, where spatial features are drawn directly on the map canvas using the digitizing tools available in QGIS. During this stage, users can assign attribute information to each feature, either at the time of creation or later through the attribute table. This method is extensively used to map and record spatial objects such as buildings, transportation

	networks, vegetation, and land parcel boundaries. Through digitization, QGIS enables users to transform visual or scanned map data into accurate and editable vector datasets that can be analyzed or shared for various GIS applications.
Procedure and Execution (100 Words)	Implementation Steps: Procedure for Creating a Shapefile in QGIS 1. Launch the GIS Application: Begin by opening QGIS or any other Geographic Information System (GIS) software installed on your system. Once the interface loads, ensure that the project environment is properly set up with the desired map canvas and coordinate display options. 2. Initiate a New Shapefile Layer: Navigate to the Layer menu, select Create Layer, and then choose New Shapefile Layer. This option allows the user to generate a new vector data file that will store the spatial features to be digitized. 3. Select the Geometry Type: Choose an appropriate geometry type depending on the nature of the spatial data to be represented. • Point layers are used for discrete objects like trees, wells, or landmarks. • Line layers are suitable for features such as roads, rivers, or pipelines. • Polygon layers represent area-based entities like plots, lakes, or building footprints. 4. Define the Coordinate Reference System (CRS): Assign a Coordinate Reference System to ensure spatial accuracy. The CRS determines how the spatial data will align geographically on the map. Commonly used systems include WGS 84 (EPSG:4326) or UTM zones depending on the study region. 5. Add Attribute Fields: Create attribute fields to store descriptive information about each feature, such as Name, ID, Area, or Type. These fields can be of different data types—text, integer, or decimal—depending on the kind of data being recorded. 6. Save the Layer File:

	After configuring the geometry and attributes, click OK, choose a suitable file name, and specify the folder location where the shapefile will be saved. QGIS automatically generates the associated files required for shapefile storage (e.g., .shp, .shx, .dbf). 7. View the Layer in the Project: The newly created shapefile will now appear in the Layers Panel of QGIS. It will initially be empty but ready to store new features once editing begins. 8. Enter Edit Mode and Digitize Features: Activate Edit Mode by clicking the pencil icon or right-clicking the layer and selecting Toggle Editing. Using the digitizing tools (Add Point, Add Line, or Add Polygon), begin plotting features directly on the map canvas. Attributes can be entered simultaneously or updated later through the attribute table. Through these steps, users can effectively create and manage a new shapefile in QGIS, enabling them to perform further spatial analysis, map creation, or data visualization tasks.
	Stepwise Screenshots with steps:

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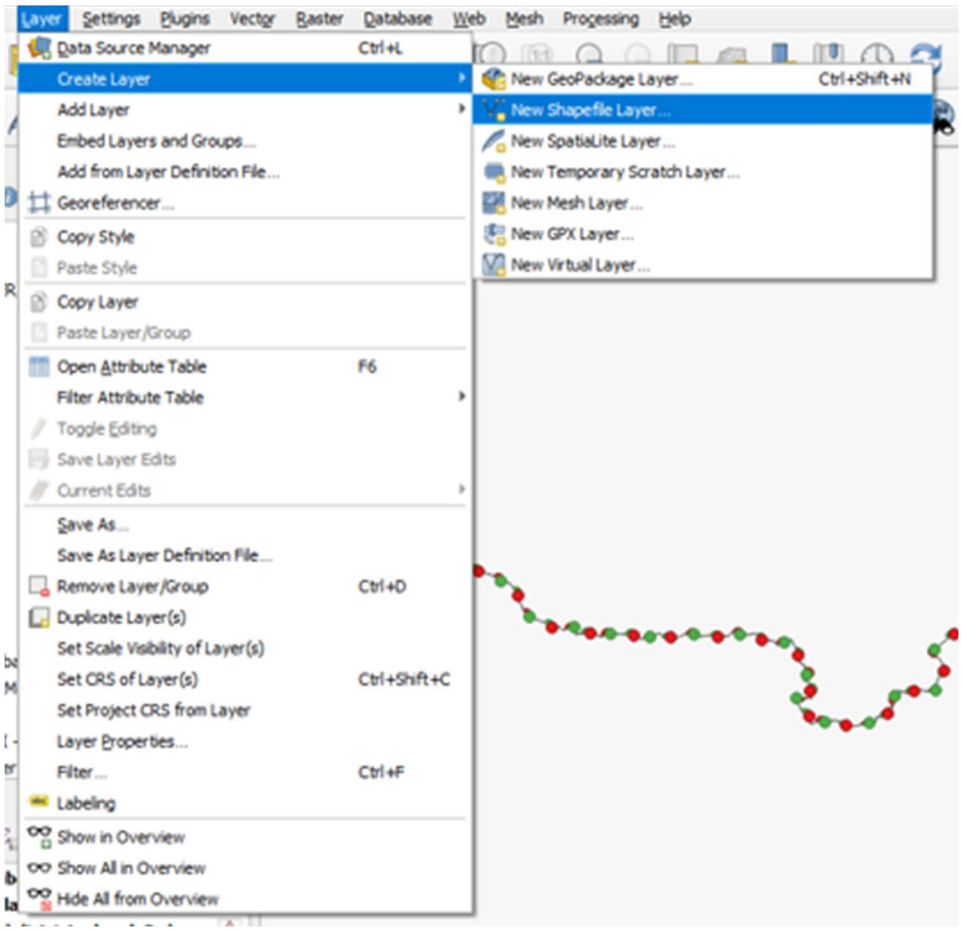

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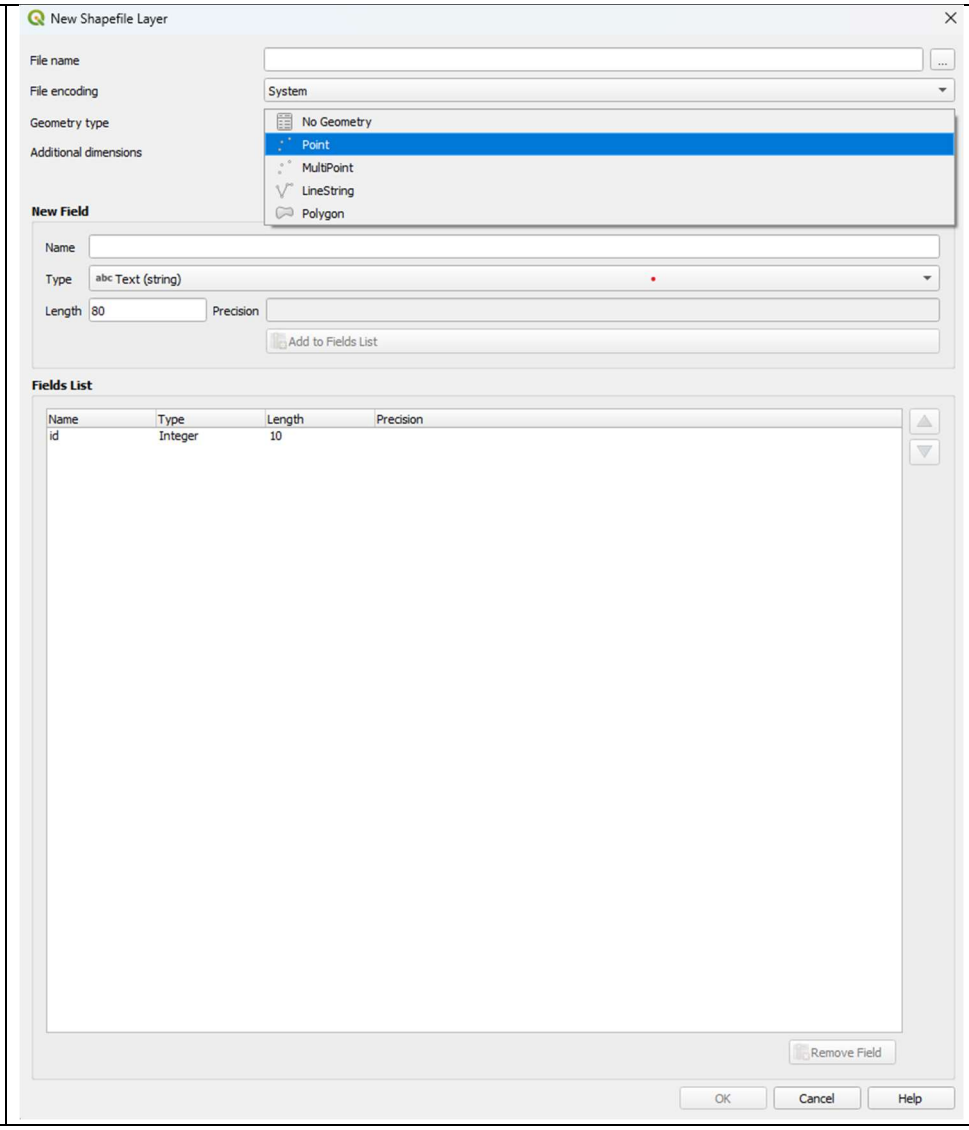

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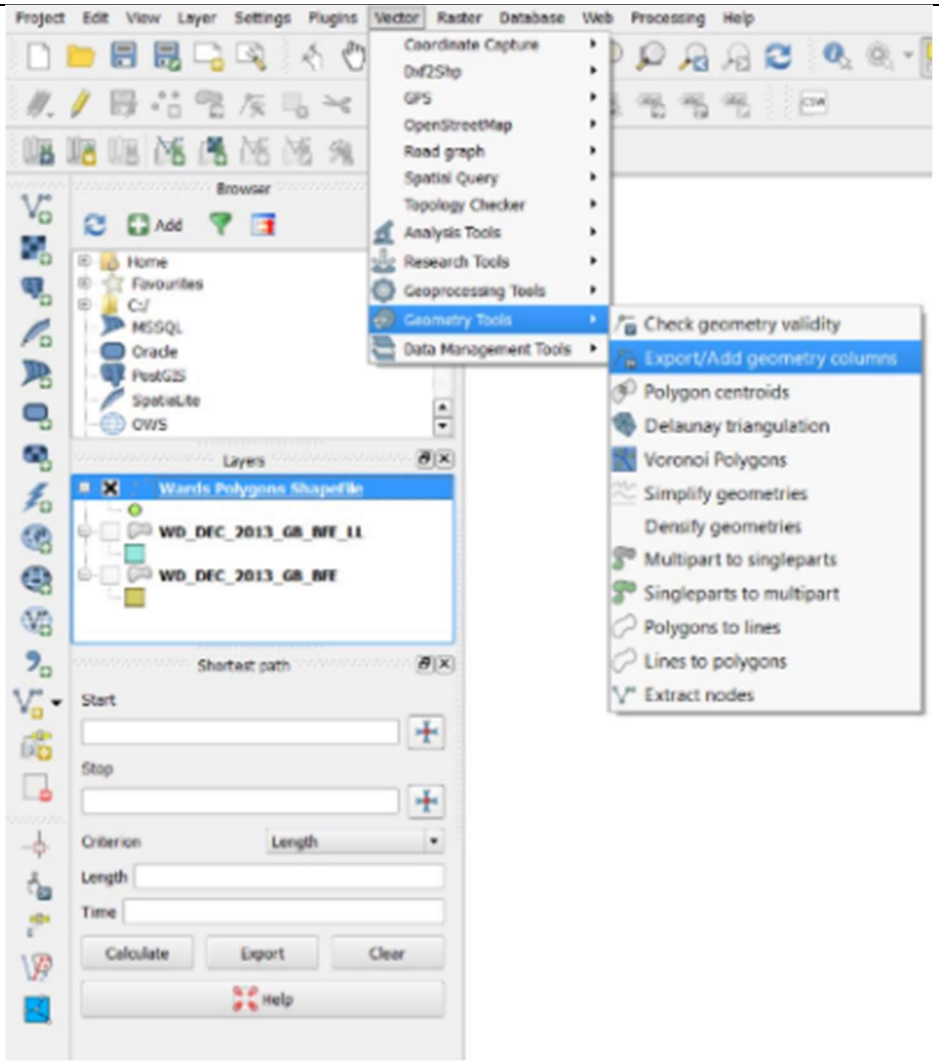
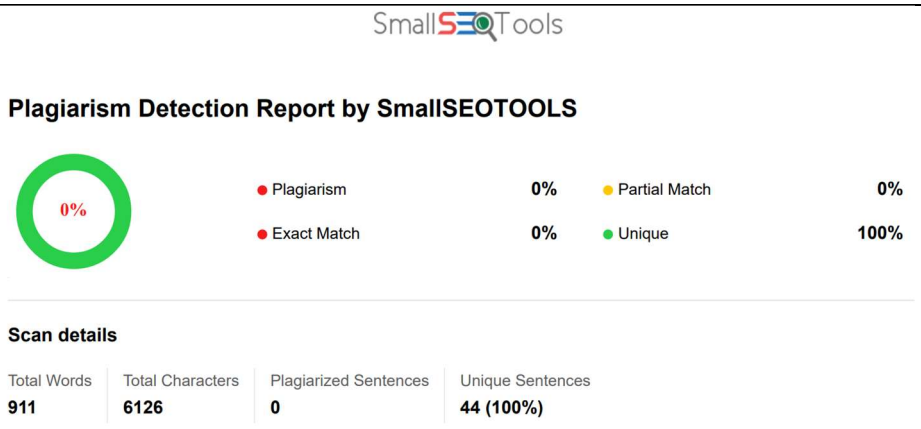
	
Output Analysis	The practical task was executed by creating a GeoPackage database within QGIS, which served as the central storage for all spatial layers. Using the built-in editing and digitization tools, multiple feature types—points, lines, and polygons, were successfully created and visualized on the map canvas. Each geometry type represented different categories of spatial entities: point features denoted discrete objects such as landmarks or trees; line features depicted linear elements like roads and drainage paths; while polygon features were used to outline area-based components such as plots, buildings, or lakes. The digitization process ensured that every feature was accurately placed in accordance with the defined Coordinate Reference System (CRS).

	Furthermore, attribute information was added for each feature during editing, enhancing the dataset with descriptive and analytical value. The final GeoPackage layer was saved and verified for spatial accuracy, ensuring that all elements were properly aligned and topologically correct. This confirmed the successful implementation of the digitization process and demonstrated the practical capability of QGIS in handling, storing, and managing vector data efficiently.
Link of student GitHub profile where lab assignment has been uploaded	"https://github.com/Bhushan-Tayade/YCCN-23071391.git"
Conclusion	The experiment was successfully carried out by creating GeoPackage and Shapefile layers within the QGIS environment. The process of digitizing spatial features, including points, lines, and polygons—was completed effectively using the available editing tools. Each geometry type was accurately drawn and attributed, reflecting real-world features on the map canvas. Through this practical, the fundamental concepts of vector data creation, spatial layer management, and digital cartography were demonstrated. The task validated the capability of QGIS to serve as a powerful open-source platform for geospatial data generation, visualization, and analysis. Overall, the activity provided a clear understanding of how raw spatial information can be converted into structured digital datasets suitable for further mapping and GIS-based applications.
Plag Report (Similarity index <= 12%)	
Date	12-08-2025