UNIVERSITY OF MORATUWA

DEPARTMENT OF DECISION SCIENCES

BACHELOR OF BUSINESS SCIENCE (BBSc.)

Semester V

DA3481 – GIS & Spatial Data Analysis

Assignment

No. of questions: 4 **No of Pages: 4**

Instructions to Candidates

1. **Answer all the Questions.**
2. **Submit before the deadline.**
3. **All written responses must be in English**

Part 1: Creating a Map of the Western Province

1. Data Preparation:
    - Download the provided District shapefile dataset. The shapefile includes multiple files such as .shp, .dbf, .shx, .prj, etc. Make sure you have all these files for correct import into QGIS.
2. Loading Data into QGIS:
    - Open QGIS and create a new project.
    - Add the District.shp shapefile into your QGIS project by navigating to Layer > Add Layer > Add Vector Layer.
    - Confirm that the data contains the boundaries of the Western Province.
3. Styling the Data:
    - Style the District layer with suitable symbols for the boundaries and fill colors to distinguish the districts in the Western Province.
    - Apply a color scheme that clearly differentiates between the various districts.
4. Adding Map Elements:
    - Add the following map elements to your layout:
        - Title: Provide a relevant title for your map (e.g., "District Boundaries of Western Province").
        - Legend: Include a legend to explain the symbols/colors used for the districts.
        - Scale Bar: Add a scale bar for distance reference.
        - North Arrow: Add a north arrow to indicate map orientation.
        - Borders: Ensure a clean border around the map for presentation.
5. Map Layout:
    - Adjust the layout for proper alignment of all elements.
    - Use the Print Layout option to finalize your map.
    - Export your map as a PNG or PDF.
6. Export the Shapefile:
    - After performing any edits or queries on the district layer, export the Western Province District layer as a new shapefile.
    - Deliverable: Submit the exported shapefile and the Western Province map.

Part 2: Answer the following theory questions related to QGIS:

1. What are the core functions of QGIS that make it a powerful tool for spatial data analysis and visualization?
   Discuss its capabilities in data manipulation, styling, and analysis.
2. What are the advantages of using GIS in business operations?
   Provide examples of how GIS can improve decision-making, logistics, and marketing strategies in business.

Part 3: QGIS for Studies and Research

1. Research Paper Reading:
   - Download and read a research paper related to your field of study where QGIS has been used for analysis. (You can find relevant papers from platforms like Google Scholar or ResearchGate).
2. Answer the following:
   - How is QGIS used in the research paper you read?
   - How can you relate the use of QGIS in the paper to your own field of study?
   - Explain how QGIS was utilized for spatial analysis or decision-making in the context of the research.

Part 4: Raster Analysis – NDVI and NDWI Calculations

1. Download and Load Raster Data:
   - Download the provided Landsat image data (file L8_141054_2023.img and its associated files). Load the raster data into QGIS.
   - You should use the Band 4 (Red) and Band 5 (Near-Infrared, NIR) for NDVI calculation, and Band 5 (NIR) and Band 3 (Green) for NDWI calculation.
2. NDVI Calculation: NDVI (Normalized Difference Vegetation Index) is used to monitor vegetation health and density.
3. Steps:
   - Open the Raster Calculator in QGIS.
   - Use the equation above with the respective bands for Red and NIR.
   - Set the output raster and click OK.
4. NDWI Calculation: NDWI (Normalized Difference Water Index) is used to monitor water content. The equation for NDWI is:
   - Use the Raster Calculator again.
   - Input the equation for NDWI using the respective bands for NIR and Green.

- Set the output raster and click OK.

5. Deliverable:
    - Submit screenshots of the NDVI and NDWI output rasters.
    - Provide a brief explanation of what each index represents and how they can be used in environmental studies or land use management.

Submission Requirements:

- QGIS Project File: Submit the .qgz file with your map of the Western Province and any changes made.
- Shapefile Export: Provide the exported shapefile for the Western Province districts.
- Western Province map with map elements.
- Raster analysis (NDVI and NDWI results).
- Theory Answers: Submit your answers to the two theory questions.
- Research Paper Summary: Provide a summary of how QGIS was used in the research paper, along with an explanation of its relevance to your field.