The National University of Lesotho

BSc Examination

ES2412: Introduction to Geographical Information System (GIS)

May 2023 Marks: 100 3 Hours

Instructions:

- Answer any **FOUR (4)** questions
- Where applicable, illustrate your answers with equations and diagrams
- Where there are calculations, clearly show the calculation steps that were followed

Question One

a) Showing all the working fill up the table below:

Longitude Degree Decimal	Longitude			Latitude Degree Decimal	Latitude		
	Degree	Minutes	Seconds		Degree	Minutes	Seconds
27.7207				-29.4484			
27.7214				-29.4483			
27.7217				-29.4486			
27.7226				-29.4480			
27.7239				-29.4484			
27.7240				-29.4486			
27.7246				-29.4482			
27.7247				-29.4485			
27.7244				-29.4494			
27.7246				-29.4504			

Table 1

[20]

b) Convert the following Decimal Degrees (DD) coordinate into Degrees Minutes Seconds (DMS)

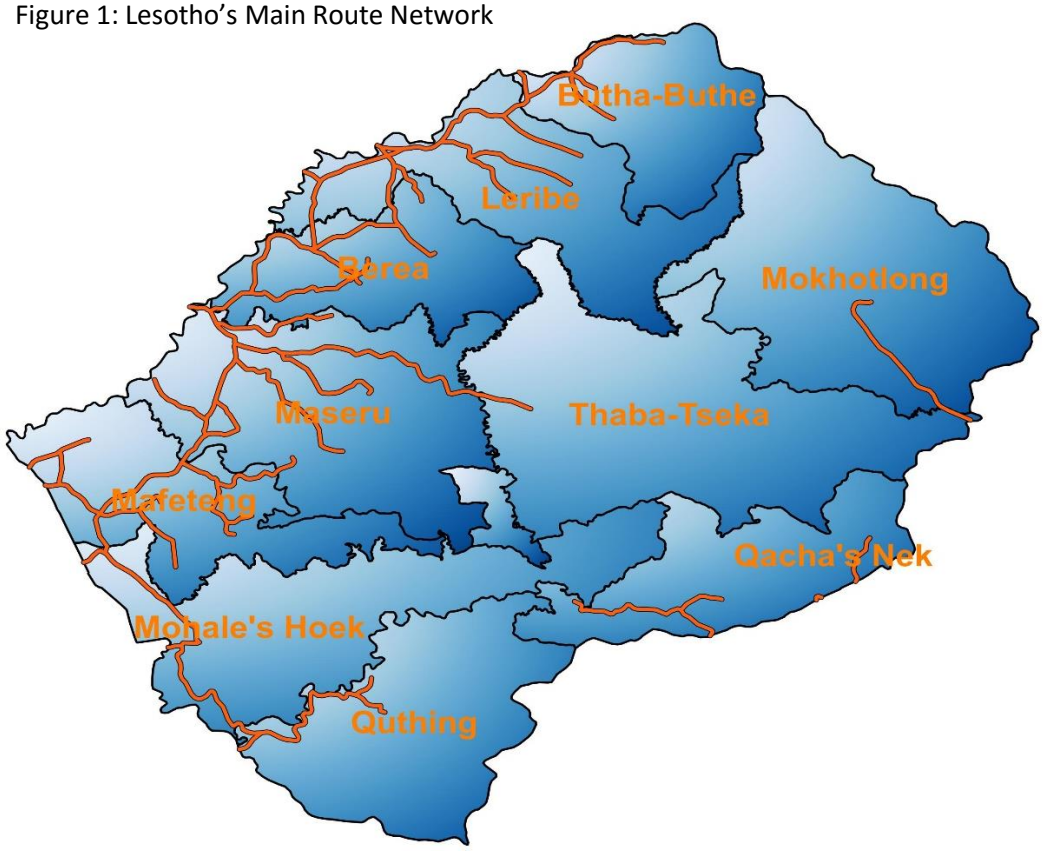
i. 29° 27' 3.96" S, 27° 43' 24.96" E
ii. 29° 26' 56.4" S, 27° 43' 13.08" E
iii. 29° 26' 52.44" S, 27° 43' 20.64" E
iv. 29° 26' 54.6" S, 27° 43' 22.08" E
v. 29° 26' 54.6" S, 27° 43' 24.6" E [5]

(25 Marks)

Question Two

a) Which SIX critical elements of a map are missing in figure 1 below:

Figure 1: Lesotho's Main Route Network



[6]

b) Which QGIS geoprocessing tool(s) would you use in the following situations?

i. You are given a large shapefile with settlements for the entire Mohokare catchment but your study area is just the inner settlements of Berea. You want to reduce the settlement file to only your area of interest. [1]

ii. You are given two shapefiles of point data collected around the NUL campus. Both shapefiles are in the same co-ordinate system and you want to combine them into one shapefile to perform analysis. [1]

iii. You have a shapefile of points and a shapefile of road lines. You want to create a new shapefile containing only points that are within 200 m of a road. [2]

c) What is a geoprocessing tool? Give an example of a geoprocessing tool and describe its function. [5]

d) Explain the difference between projection and coordinate systems. Why is it important to use the correct projection and coordinate system when working with spatial data? [5]

e) What is metadata? Why is metadata important in GIS? [5]

(25 Marks)

Question Three

a) Explain the difference between primary and secondary data sources. Give an example of each. [5]

b) Describe the process of digitizing paper maps. What are some challenges you might encounter when digitizing maps? [5]

c) What is GPS? Explain how GPS can be used to collect spatial data. [5]

d) Define GIS and explain how it is different from traditional mapping. [5]

e) Explain the difference between vector and raster data models. Give an example of a situation where you would use each data model. [5]

(25 Marks)

Question Four

a) What is the difference between raster and vector data models in GIS? Provide an example of an application where each data model would be best suited. [15]

b) What are the functions of a GIS? Explain each function in detail. [10]

(25 Marks)

Question Five

a) List **THREE** Sources of Raster Data, and explain whys is important to use Raster dataset over other dataset? [5]

b) Define the following terms

i. Resolution

ii. Pixels

iii. Spatial data

iv. Geoinformation

v. Spatial Resolution [5]

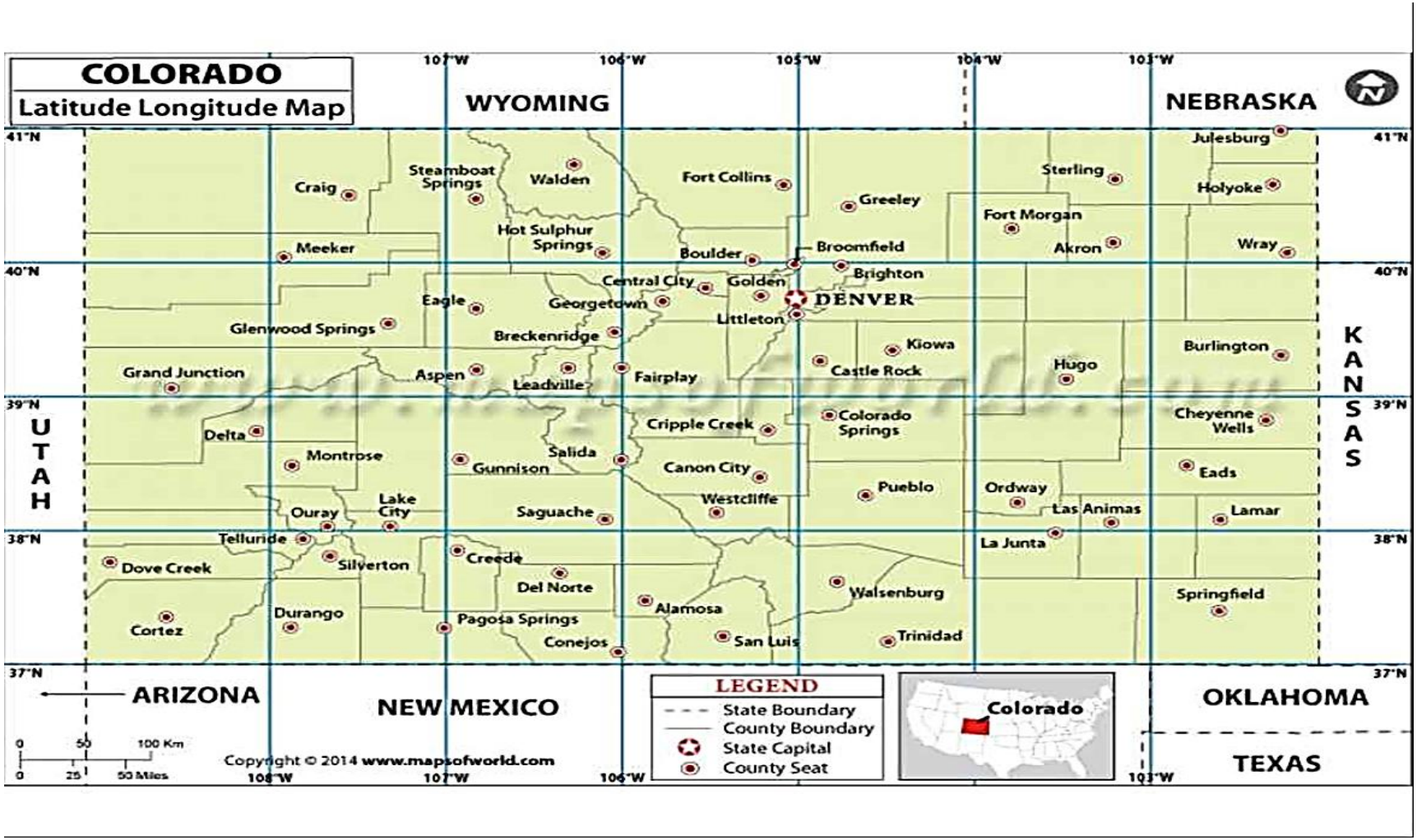
c) Describe all the important stages of working with geographic data and explain in detail the processes which take place at each stage? [10]

d) We understand GIS to be computer facilitated system, stated **five** components of a GIS? [5]

(25 Marks)

Question Six

a) Find the **coordinates** to the following cities in Colorado:



i. Denver _____

ii. San Luis _____

iii. Craig _____ [3]

b) State the Name of Cities that are represented by these grid references

i. 107.5^0W, 37.4^0N _____

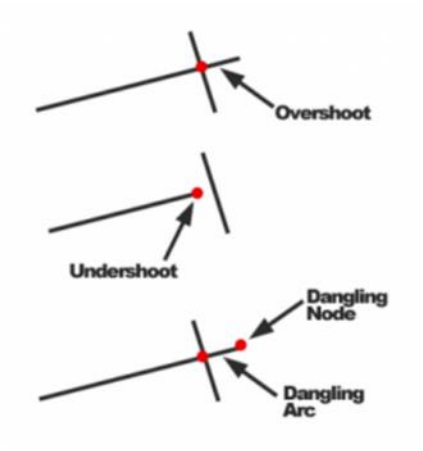
ii. 105^0W, 40^0N _____

iii. 106^0W, 38.5^0N _____ [3]

c) What factors determine the appropriate cell (pixel) size or spatial resolution of a raster in order to represent the required level of detail while ensuring efficient computer storage and analysis? [5]

d) What is a projection in GIS? Explain why projections are necessary, and provide an example of a commonly used projection. [10]

e) The following show example of……errors in vector data



[2]

f) Explain the differences between raster and vector data models and give an example of each. [4]

(25 Marks)