

UNIVERSITY OF ESWATINI
INSTITUTE OF POSTGRADUATE STUDIES
FINAL EXAMINATION, DECEMBER 2018

MSc. E.R.M.

TITLE OF PAPER: GEOGRAPHIC INFORMATION SYSTEMS

COURSE NUMBER: GEP607

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS: 1. ANSWER ONE QUESTION FROM EACH SECTION
2. ILLUSTRATE YOUR ANSWERS WITH
EXAMPLES AND CLEARLY DRAWN DIAGRAMS
WHERE APPROPRIATE

ALLOCATION OF MARKS: EACH QUESTION CARRIES 50 MARKS

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION IS GRANTED BY
THE INVIGILATOR

GEP607: GEOGRAPHIC INFORMATION SYSTEMS – DECEMBER 2018

SECTION A: ANSWER ONE QUESTION

QUESTION 1

The Ministry of Health has been collecting non-spatial data on patients since the 1950s. However, a decision has been taken to develop a national healthcare database. You are a GIS scientist, and have been engaged by the ministry as a consultant to assist in the establishment of a national healthcare geodatabase.

- a) Outline in detail the structure of the system you would propose that it be set up, and the different datasets that would be necessary to establish it. (15 marks)
- b) Fully outline and discuss the different components of the proposed system, how the components would be constituted, how data would be integrated to ensure an operational system, and how the system would be operated. (30 marks)
- c) What limitations and uncertainties would you need to highlight to the ministry for such a project and system? (5 marks)

(50 Marks)

QUESTION 2

An international investor is interested in establishing a farm for exotic fruits in the country. The investor has approached you as a GIS specialist to help produce a map of all potential sites where such a farm can be established. The following criteria have been passed to you as being key in the selection of the potential sites.

- It must be land held by freehold tenure (title deed land).
- The total area of a potential site must be at least 20 hectares.
- The terrain should be flat to slightly sloping, but not more than 5° slope as production will rely heavily on machinery.
- It must be located within twenty (20) km from a major road for ease of transportation of products and implements.
- Site must also be dominated by rich loamy soils.
- For these fruits, the lowest annual mean temperature must be above 5 °C.
- For irrigation purposes, it must have a perennial water source.

- a) Identify the data requirements including the required coverages (i.e., shapefiles or layers) that you will use in your analysis, highlighting the sources of data and cost associated with the acquisition of the data. (15 marks)
 - b) Describe in detail how you would go about identifying the potential sites for the proposed farm, including any spatial analysis that you will do on your selected coverages. (30 marks)
 - c) Explain the notes that you would develop to accompany the map in order to assist the investor to make sense of the product. (5 marks)
- (50 Marks)**

SECTION B: ANSWER ONLY ONE QUESTION

QUESTION 3

The Ministry of Natural Resources and Energy is in the process of using GIS and remote sensing to establish a 2018 national forest baseline for the country, as well as assess change backwards for the years 2008, 1998 and 1988. As a remote sensing specialist, the ministry has approached you to solicit some advice on the application of remote sensing techniques.

Discuss the GIS and remote sensing technique(s) you would recommend to the ministry, with a justification for the selection(s), as well as describe the step-by-step procedure you would advise the ministry to follow in executing the task.

(50 Marks)

QUESTION 4

- a) Identify and describe the three fundamental 'types of map features' used in desktop mapping, as well as discuss the fourth type that is extensively used in grid-based data modeling. (25 marks)
 - b) Discuss and differentiate between pixel- and object-oriented approaches in image classification. (15 marks)
 - c) Discuss the role of ground truthing in projects that rely on GIS and remotely sensed data. (10 marks)
- (50 Marks)**