DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF CIL ENGINEERING

UNIVERSITY EXAMINATIONS 2021/2022

First Year First Supplementary Examination for the Degree of
Master of Science in Civil Engineering
(Transportation Engineering Option)

ECE 6144: Remote Sensing and GIS for Transportation Engineering

Date: November 2021   Time: 3 Hours

INSTRUCTIONS: Answer question one and any other three questions

Question One [30 marks]

(i)   Define the following terms:

      a. Geographic information System(GIS)
      b. Remote Sensing   [4 marks]

(ii)   Briefly discuss the two conceptual models of representing of what is occupying or occurring in a geographic space.   [6 marks]

(iii)   Define and briefly explain the term topology as used in GIS.   [6 marks]

(iv)   Differentiate between "professional GIS" and "desktop" GIS, giving an example in each category.   [4 marks]

(v)   Outline five application areas of GIS in the transportation sector   [10 marks]

Question Two [20 marks]

(i)   Briefly differentiate between the raster and vector data models of representing geographical phenomena in GIS.   [5 marks]

(ii)   Elucidate on the concept of 'classification' as used in the context of vector spatial data analysis with GIS   [6 marks]

(iii)   Explain the following terms in the context of network analysis

      a. Optimal Path Analysis
      b. Network Partitioning
      c. Travelling salesman problem   [9 marks]

Question Three [20 marks]

(i) Briefly outline the components that make up a geographic information system [10 marks]

(ii) Discuss the concept of "ethics" as it applies to the use of GIS and spatial technologies.

[10 marks]

Question Four [20 marks]

(i) Differentiate between a data model and a data structure as used in geographic information systems.   [6 marks]

(ii) Describe the capture and processing of spatial data to build a GIS-based transportation information system.   [14 marks]

Question Five [20 marks]

(i) Briefly differentiate between the spaghetti and the topological data structures, and highlight on the advantages and disadvantages of each.   [10 marks]

(ii) What are the relative merits and demerits of the vector data models/structures as encountered in GIS?   [10 marks]

Question Six [20 marks]

(i) Discuss the "full raster" data structure, highlighting on how it may be organized for multi-band images.   [10 marks]

(ii) Outline the factors that affect the quality of spatial data in GIS.   [10 marks]