THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF CIVIL ENGINEERING
Diploma in Technology (Civil Engineering)

011

Final Examination - 2006/2007

CEX4237 - Remote Sensing & Introduction to GIS

Time Allowed: Three Hours

Date: 18th April 2007 Time: 0930-1230 hrs.

Paper consists of 3 sections A, B and C

Answer 5 questions selecting at least one question from each section.

Section A

Q1.

(i) Explain the connection between 'radiation' and 'remote sensing'. Describe in brief how satellite imagery can be used in five areas of civil engineering.

(06 marks)

(ii) Explain why the 'energy content' is lower when long wavelengths are involved and the need for large areas to be viewed in order to detect a signal from microwave emission.

(05 marks)

(iii) Images from 'Landsat' are most appropriate for land classification. Justify this statement and explain in detail the functions of the Landsat satellites in providing the relevant information.

(09 marks)

Q2.

(i) Explain the contrast between daytime and night time thermal images of water bodies and surrounding areas.

(05 marks)

(ii) Given below are the spectral characteristics of common inorganic materials (non vegetated land-areas) in figure 1 and vegetation types in figure 2. .

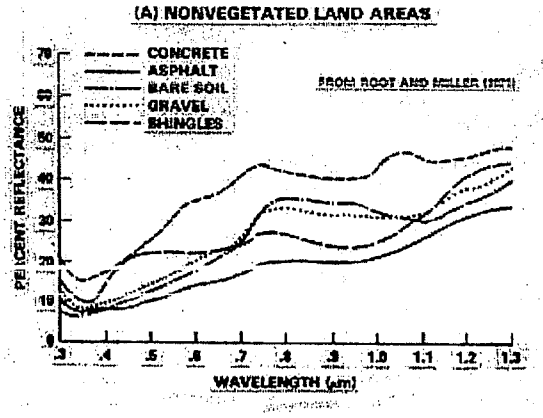


Figure 1

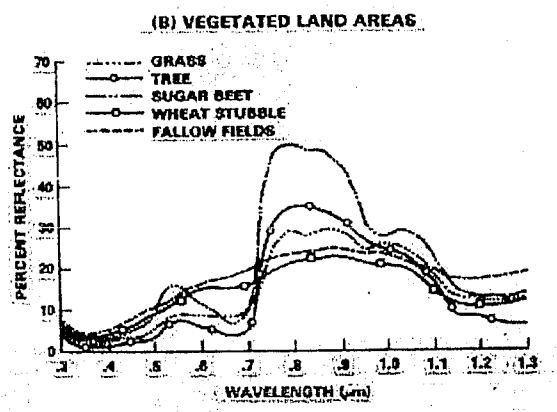


Figure 2.

Make a detailed comparison and comment on how to identify features using the spectral reflectances based on the information contained in the above diagrams.

(10 marks)

(iii) Images/photos containing feature information of a forest and a field crop with plants closely spaced are measured for their spectral values. Both features display quite similar reflectances at three chosen wavelengths. Indicating the tools/characteristics to be used describe how these features can be separated and identified.

(05 marks)

Q3.

(i) Explain the effects of 'atmospheric absorption & scattering' and 'atmospheric emission' on the radiant signals from an object

(04 marks)

(ii) Explain how we can interpret information provided in images by the infrared band.

(06 marks)

(iii) Convolution is an image processing operation used for spatial feature manipulation. Explain its theory in creating an image with sharper features.

(06 marks)

(iv) The spectral signature recorded by using radar signals is dependant on many factors. What are they?

(04 marks)

Section B

Q4.

i.) Develop a clear definition for 'Navigation'

(04 marks)

ii.) Describe the working principle of the rudimentary navagation instrument known as 'Kamal', used by ancient marinars.

(04 marks)

iii.) For navigation, the possition relative to earth should be accurately described. For this purpose coordinate systems have evolved. Discuss two such commonly used Global Coordinate Systems.

(04 marks)

iv.) Describe a 'Geodetic Datum' in the context of global positioning.

(04 marks)

v.) Using an anology if required, clearly describe what is known as a 'Geoid Model'.

(04 marks)

Q5.

i.) Discuss the technical theory that enables the satellite based GPS system.

(05 marks)

ii.) Why is the GPS component with users known as a 'GPS Reciever' ?

(05 marks)

iii.) Describe and discuss the three major segments of the NAVSTAR GPS system.

(05 marks)

iv.) What is 'Carrier Phase Tracking' ?

(05 marks)

Section C

Q6.

(i)

Explain what is a 'map' and describe the types of maps the average citizen is likely to encounter in everyday life. Explain what 'attributes' are.

(05 marks)

(ii)

Name at least four other types of specialized thematic maps you will need to guess the problems you might encounter in building a house on a piece of land you have never yet seen. Explain how the maps will help you to make decisions.

(10 marks)

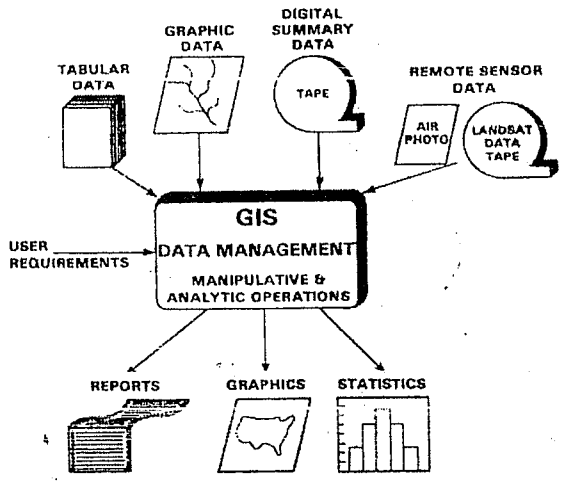
(iii) Explain the difference between 'vector' and 'raster' data forms in a GIS. From a data handling viewpoint, particularly involving computer manipulations, explain which method of geocoding, 'vector' or 'raster' would be easier to process.

(05 marks)

Q7.

(i) A major form of data input for a GIS is satellite imagery. Name five types of satellite-derived observations that lead to information relevant to GIS analysis.

(05 marks)



(ii) What is the most important factor or key determinant in the above Data Management diagram? Explain.

(05 marks)

(iii) Suppose you are given the task of making the preliminary assessment of the feasibility of constructing a garment factory made of steel, in the outskirts of Colombo. Identify the factors based on which maps and data need to be sought to determine the suitability of the place where the factory should be located. Describe how you will make decisions using the information obtained.

(10 marks)