2901/304
GEOGRAPHIC INFORMATION
SYSTEMS (GIS)
Oct./Nov. 2021
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN PETROLEUM GEOSCIENCE

MODULE III

GEOGRAPHIC INFORMATION SYSTEMS
(GIS)

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
A mathematical table/A non-programmable scientific calculator;
An answer booklet.
*This paper consists of **EIGHT** questions.*
*Answer **Question 1 (Compulsory)** and any other **FIVE** questions in the answer booklet provided.*
Maximum marks for each part of a question are indicated.
Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

1. Figure 1 shows the electromagnetic spectrum.

(a) Identify the types of radiations labelled A, B, C, D, E and F. (3 marks)

(b) Describe electromagnetic spectrum. (4 marks)

(c) Describe the following types of radiations:

(i) radio waves;
(ii) microwaves. (10 marks)

(d) State any six colours for the visible light of the electromagnetic spectrum from the long wavelength of low frequency to the short wavelength of high frequency. (3 marks)

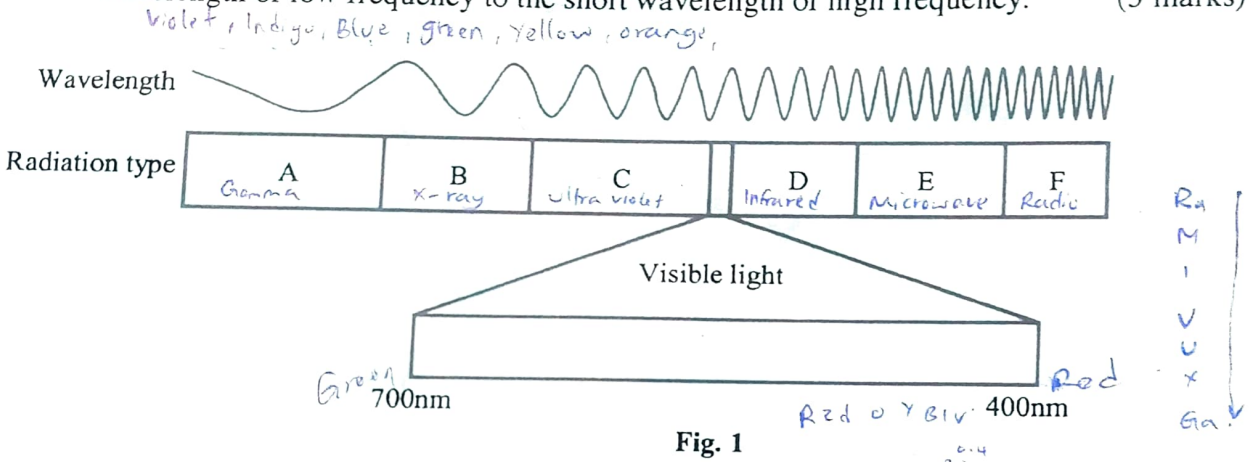

Fig. 1

2. (a) Describe optical remote sensing. (5 marks)

(b) Explain **four** classifications of optical remote sensing. (5 marks)

(c) State **three** advantages and **two** disadvantages of optical remote sensing. (10 marks)

3. (a) Explain each of the following categories of microwave remote sensing:

(i) passive;
(ii) active. (7 marks)

(b) Describe each of the following categories of microwave sensors:

(i) radiometers;
(ii) scatterometers. (6 marks)

(c) (i) Define "digital image processing" in remote sensing.
(ii) Describe "pre-processing" in digital image processing.
(iii) Describe radiometric correction method in digital image processing and state **one** radiometric distortion which may be corrected. (7 marks)

4. In GIS mapping, data may be presented in terms of Vector and Raster concepts as shown in figure 2.

(a) (i) Identify Raster and Vector data from the figure.
(ii) Explain the difference between Raster and Vector data. (4 marks)

(b) Explain the different types of geometry used for Vector data. (6 marks)

(c) (i) State **two** advantages and two disadvantages of Raster data.
(ii) Explain **three** methods used for encoding Raster data from scratch. (10 marks)

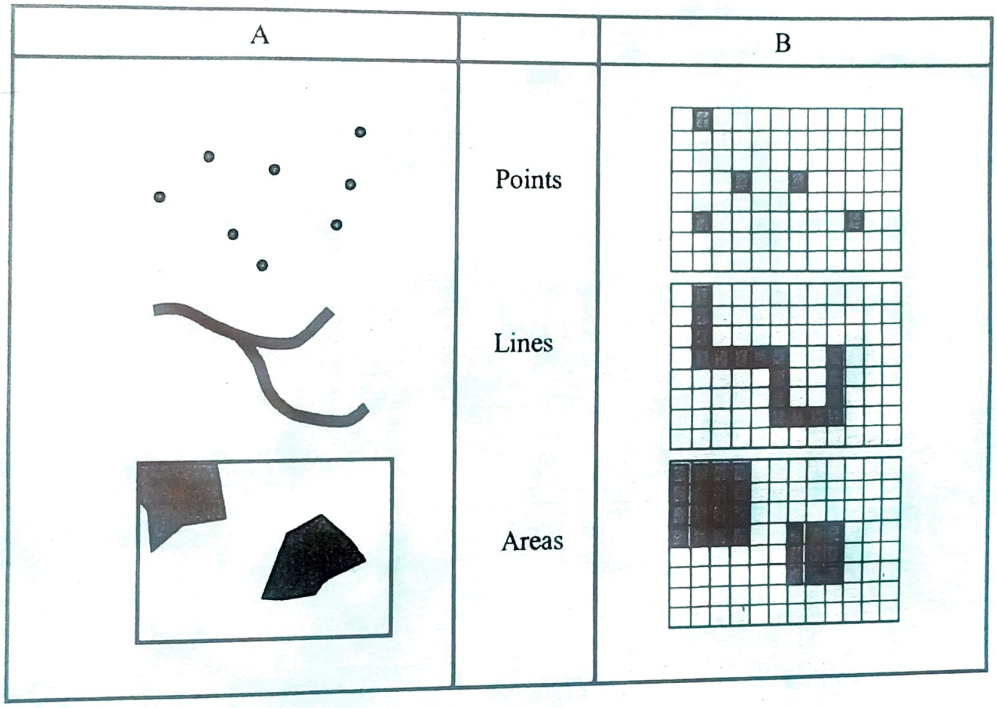

Fig. 2

5. (a) (i) Define data visualization in GIS.
(ii) Describe **five** methods for visualization of geospatial data. (11 marks)

(b) (i) Define data transformation in GIS.
(ii) State **five** benefits and **three** challenges encountered in data transformation. (9 marks)

6. (a) (i) Define GPS.
(ii) Describe the **three** segments of GPS. (10 marks)

(b) (i) Explain the use of triangulation in GPS.
(ii) State **three** advantages and **three** disadvantages of triangulation in GPS. (7 marks)

(c) Outline the steps to show how GPS works. (3 marks)

7. (a) Explain **four** applications for GIS in petroleum industry. (10 marks)

(b) Outline **four** benefits of GIS in oil and gas exploration. (6 marks)

(c) Describe each of the following types of GPS:

(i) A-GPS;
(ii) S-GPS. (4 marks)

8. (a) Explain each of the following with reference to GIS data:

(i) data integration;
(ii) data integration systems. (8 marks)

(b) Discuss Google earth. (12 marks)

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