

2901/305
REMOTE SENSING
June/July 2022
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN PETROLEUM GEOSCIENCE

MODULE III
REMOTE SENSING

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Non programmable scientific calculator (fx-82).

This paper consists of EIGHT questions.

Answer question any 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.

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1. (a) State the spectral bands and their appropriate wave length range as used in optical remote sensing. (9 marks)
- (b) Describe the use of ultra violet radiation as used in oil spillage detection in sea. (4 marks)
- (c) (i) Explain the interaction of water in the visible and near infrared wavelengths. (5 marks)
- (ii) State **two** factors affecting reflectance of electromagnetic radiation by water. (2 marks)
2. (a) With the aid of labelled diagram, explain the following properties of electromagnetic radiation:
- (i) wavelength; (3 marks)
- (ii) amplitude; (3 marks)
- (iii) period. (3 marks)
- (b) (i) State the **three** subdivisions of infrared radiation and their wavelength range. (6 marks)
- (ii) Give **one** application of each of the sub-divisions name in named in b (i). (3 marks)
- (iii) State **two** advantages of active remote sensing. (2 marks)
3. (a) State **five**:
- (i) factors affecting reflection of electromagnetic radiation by a target; (5 marks)
- (ii) changes electromagnetic radiation experiences on interaction with a target. (5 marks)
- (b) Explain **three** types of scattering of electromagnetic radiation in the atmosphere. (10 marks)
4. (a) With the aid of a relevant equation, explain the relationship between wavelength and frequency of electromagnetic radiation. (4 marks)
- (b) (i) State **three** absorbers of electromagnetic radiation in the atmosphere. (3 marks)
- (ii) Name the region of the electromagnetic radiation absorbed by each of the absorbers named in (i), indicating their corresponding wavelength range. (9 marks)
- (c) Define the following terms:
- (i) sensor; (1 mark)
- (ii) remote sensing; (1 mark)
- (iii) spectral reflectance; (1 mark)
- (iv) radiance. (1 mark)



5. (a) Explain five steps of digital image classification. (15 marks)
- (b) List five sub-divisions of visible light in descending order of wavelength. (5 marks)
6. (a) Give the Planck's radiation equation, defining all the terms in it. (6 marks)
- (b) Explain two applications of thermal remote sensing. (4 marks)
- (c) State two processes that take place in the following digital image processing techniques:
- (i) preprocessing; (2 marks)
- (ii) image transformation. (2 marks)
- (d) State four activities of digital image enhancement in remote sensing. (4 marks)
- (e) Name two examples of satellites rotating around the earth. (2 marks)
7. (a) (i) Give the formula for normalized difference vegetation index (NDVI) and define all the terms in it. (4 marks)
- (ii) A vegetation had a 50% reflectance in near infrared and 8% reflectance in red. Calculate the NDVI. (2 marks)
- (iii) Identify whether the vegetation is healthy or stressed giving two reasons for the answer. (3 marks)
- (b) Figure 1 shows spectral reflectance curves of five minerals labelled A, B, C, D and E. Study and use it to answer the questions that follow.

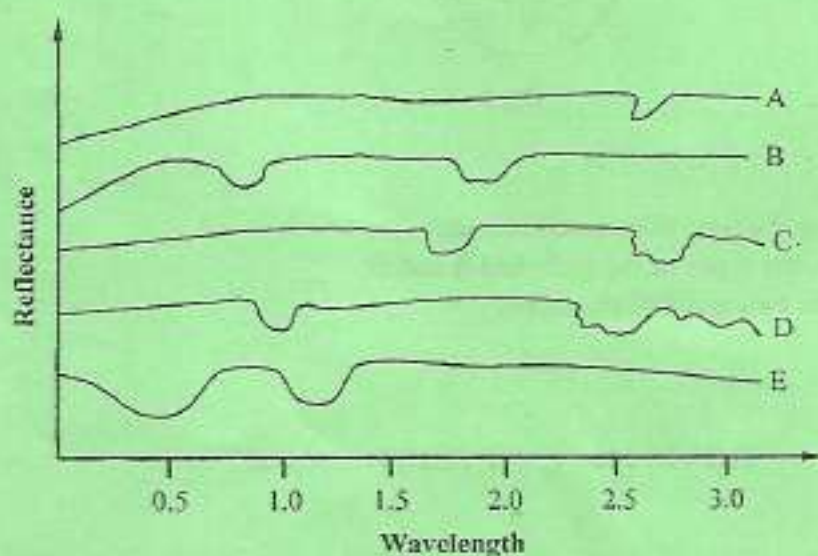


Fig. 1



- (i) identify the minerals indicated by each of the reflectance curve with any of the following minerals: calcite, pyroxene, quartz, haematite or kaolinite. (5 marks)
- (ii) identify the curve with iron rich minerals. (2 marks)
- (c) (i) State the electromagnetic radiation detected by human eye and its corresponding wavelength range; (3 marks)
- (ii) State the unit of measurement of reflectance. (1 mark)
8. (a) Explain the six stages of remote sensing. (12 marks)
- (b) State three uses of filter operations in digital image enhancement. (3 marks)
- (c) Figure 2 shows a type of remote sensing. Study and use it to answer the questions that follow.

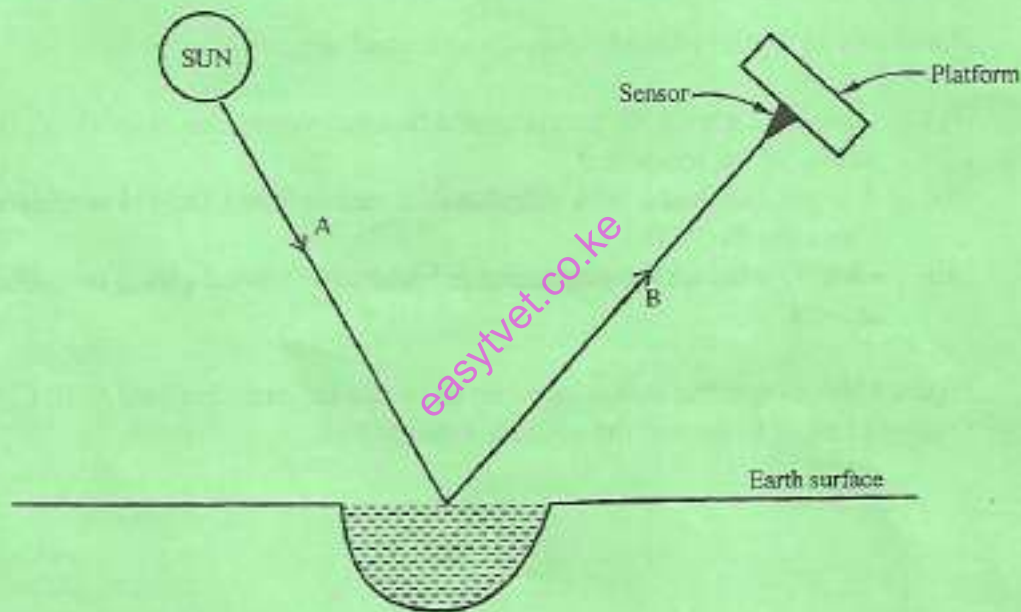


Fig. 2

- (i) name the type of remote sensing; (1 mark)
- (ii) state the types of rays labelled A and B; (2 marks)
- (iii) name **two** types of platforms. (2 marks)

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