

2528/201
2922/201
EARTH SCIENCE AND
ENVIRONMENTAL INFORMATION SYSTEMS
June/July 2021
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY
MODULE II

EARTH SCIENCE AND ENVIRONMENTAL INFORMATION SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

answer booklet;

non-programmable scientific calculator.

This paper consists of TWO sections: A and B.

Answer ALL the questions in section A and any THREE questions from section B in the answer booklet provided.

Each question in section A carries 4 marks while each questions in section B carries 20 marks.

Maximum marks for each part of a question are as shown.

Candidates should answer the questions in English.

This paper consists of 5 printed pages.

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

SECTION A (40 marks)

Answer ALL the questions in this section.

1. Describe information theory as used in information communication systems. (4 marks)
2. Explain why a radio detection and ranging (RADAR) used to measure the speed of a car is a type of active remote sensor. (4 marks)
3. (a) List any two properties of a second trip echo from a RADAR system. (2 marks)
(b) State two ways of eliminating second trip echoes. (2 marks)
4. Figure 1 shows radiative transfer process. Name the processes labelled A, B, C and D. (4 marks).

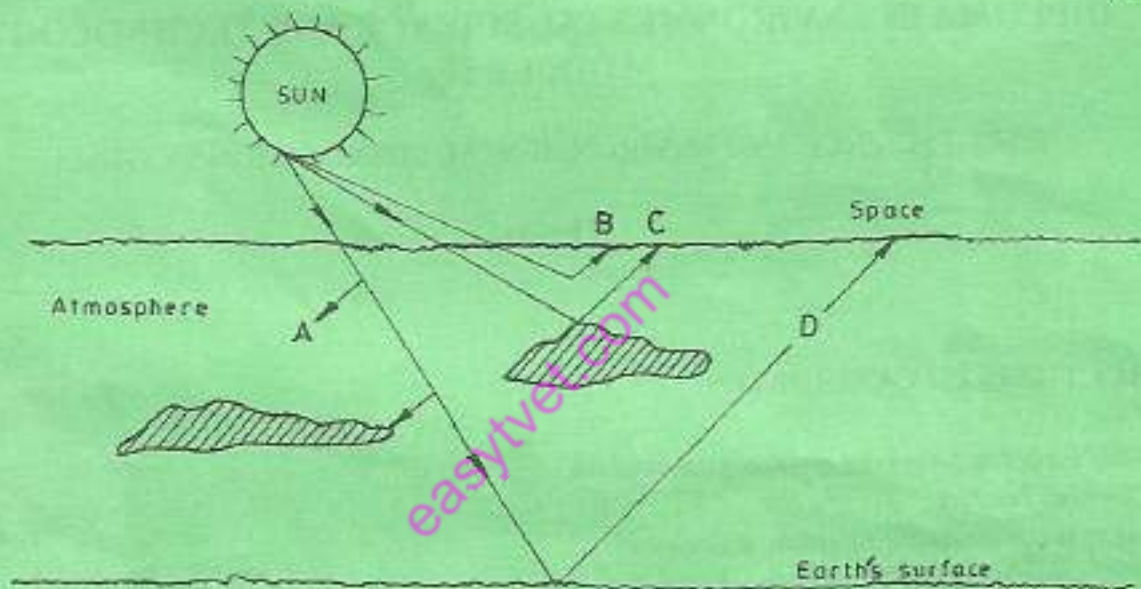


Fig. 1

5. Explain the use of principal component analysis (PCA) in Geographic Information Systems (GIS). (4 marks)
6. Describe two limitations of Global Positioning System (GPS) technology. (4 marks)
7. Use a labelled diagram to describe the three segments of Earth's interior. (4 marks)
8. Distinguish between a fold axis and an axial plane as used in folding. (4 marks)

9. Describe the phenomenon shown in figure 2.

(4 marks)

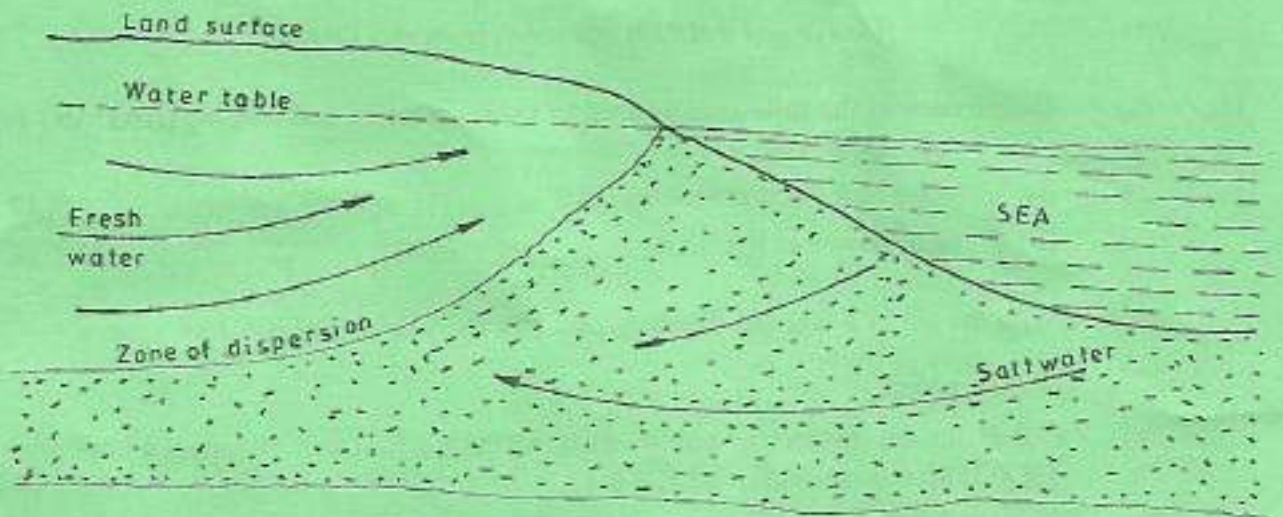


Fig.2

10. Name the types of rocks labelled A, B, C and D in the rock classification scheme shown in figure 3.

(4 marks)

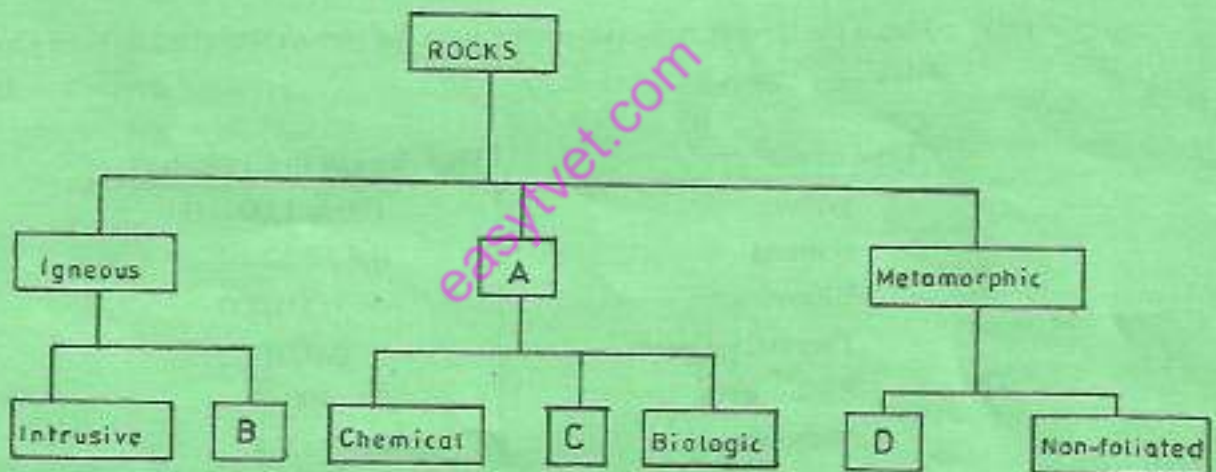


Fig.3

SECTION B (60 marks)

Answer any **THREE** questions from this section.

- 11 ✓ (a) Define each of the following as used in radio detection and ranging (RADAR) systems:
- (i) pulse repetition frequency (PRF); (2 marks)
 - (ii) peak power of RADAR. (2 marks)
- (b) With the aid of a labelled diagram, describe the working of RADAR system. (13 marks)
- (c) Determine the distance of a ship sailing towards a RADAR system at a port, given that $TR = 2580$ milliseconds, and $C = 0.15$. (3 marks)

12. (a) (i) Define radiative transfer as used in satellite systems. (2 marks)
- (ii) List **three** processes which affect propagation of radiation through a medium. (3 marks)
- (iii) Match the type of radiative energy with the correct wavelength band shown in table 1. (6 marks)

Type of energy	Wavelength (micrometer)
- visible	• 100 to 1,000,000
- Gamma	• 0.4 50 0.7
- Ultraviolet	• $> 1,000,000$
- Thermal infrared	• < 0.0001
- Radiowaves	• 4 to 100
- Microwaves	• 0.01 to 0.4

- (b) (i) Draw a labelled diagram describing satellite drag phenomenon in the atmosphere. (6 marks)
- (ii) Explain why the drag force on the satellite increases during day time. (3 marks)

13. (a) Describe the use of remote sensing method in monitoring each of the following:
- (i) drought; (7 marks)
 - (ii) volcanic activity based on chemistry of volcanic gases. (5 marks)
- (b) State **four** benefits of using space-based techniques in monitoring offshore oil spills. (8 marks)
14. (a) (i) Define salt dome as used in geology. (2 marks)
- (ii) With the aid of a labelled diagram, describe the formation of a salt dome. (10 marks)
- (b) Distinguish between lopolith and phacolith intrusive igneous rocks. (4 marks)
- (c) Draw a labelled diagram describing platform and shield minor structures of earth's crust. (4 marks)
15. (a) Distinguish between cleavage and fracture properties of minerals. (4 marks)
- (b) Describe texture as a property of sedimentary rocks. (4 marks)
- (c) With the use of a labelled diagram, difference between a geyser and a hot spring. (12 marks)

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