

2528/201
2922/201
EARTH SCIENCES AND
ENVIRONMENTAL INFORMATION SYSTEMS
June/July 2017
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY
MODULE II

EARTH SCIENCES 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 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 question 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 questions in this section.

- (a) Define the term 'communication system'. (2 marks)

(b) List any two transmission media used in communication systems. (2 marks)
- Differentiate between the transmitter and receiver components used in a communication system. (4 marks)
- Explain the following phenomena on scattering mechanisms of active sensors:

(a) ^{Regular} specular reflection produces typical pixel values of less than 20 dB; (2 marks)

(b) ^{Diffuse} typical pixel values of a vegetation cover is greater than 20 dB. _{reflectivity.} (2 marks)
- Name the parts labelled A, B, C and D of a pulsed radar system shown in Figure 1. (4 marks)

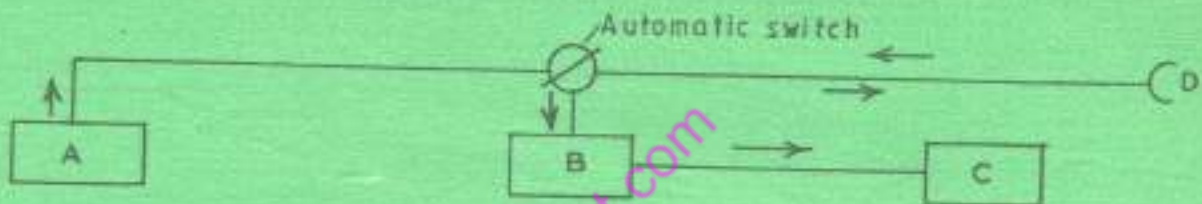


Fig. 1

- Explain the consequences of having many satellites in space. (4 marks)
- (a) Describe the storage method of data that are used to identify the geographical location of an ocean. (2 marks)

(b) State two properties of a computer that makes it suitable for use as a Geographical Information System (GIS) hardware. ^{Memory} ^{storage} ^{digital data} (2 marks)
- Explain the role of atomic clocks in Global Positioning System (GPS) satellites. (4 marks)
- Explain the difference in heat flow between ocean bottom in deep water and island arcs. (4 marks)
- List four conditions that necessitate the formation of Himalayas mountain through folding. (4 marks)



10. Match the sedimentary rock feature with the respective depositional environment shown in Table 1. (4 marks)

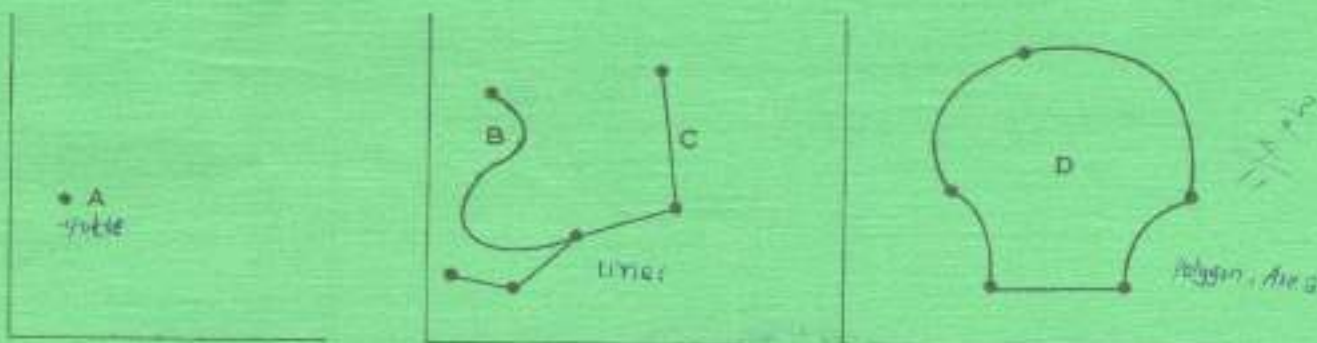
Table 1

	Sedimentary rock feature	Depositional environment
I.	Coal	Lagoons in arid climate
II.	Thin - bedded shales	Shallow ephemeral lakes
III.	Mud cracks	Carbonate tidal flats
IV.	Stromatolites with tufa/limestones	Delta swamps

SECTION B: (60 marks)

Answer any THREE questions from this section.

11. (a) State two disadvantages of using radars instead of satellites as remote sensing tools. (4 marks)
- (b) Explain the significance of determining uncertainty in remote sensing measurements. (5 marks)
- (c) Use a labelled plot to show the bias associated with typical remote sensing measurements. (5 marks)
- (d) (i) Describe two ways of differentiating systematic errors from random errors in remote sensing measurements. (4 marks)
- (ii) State two challenges faced when determining systematic errors in remote sensing measurements. (2 marks)
12. (a) Differentiate between topographic and thematic maps. (4 marks)
- (b) Identify the parts labelled A, B, C, and D in the GIS data types shown in Figure 2. (4 marks)



Vector Data

Fig. 2



- (c) Describe two challenges faced in the performance of map projection of GIS data. (4 marks) ✓
- (d) (i) Describe the technique of image histogram as used in contrast enhancement of satellite images. (5 marks) ✓
- (ii) Compare the processes of selecting information classes in supervised and unsupervised image classification and analysis. (3 marks) ✓

13. (a) Show that the tangential velocity of a geostationary satellite in space is given by the equation $V_g^2 = \frac{GM_e}{r}$. (5 marks) ✓
- (b) Explain the application of remote sensing and GIS in flood prevention and mitigation. (5 marks) ✓
- (c) State five challenges of using the approach in 13(b). (5 marks) ✓
- (d) Describe the user component of the Global Positioning System (GPS). (5 marks) ✓

14. (a) Differentiate between domes and structural basins. (4 marks) ✓
- (b) Explain the formation of the structures shown in Figure 3 and Figure 4. (4 marks) ✓

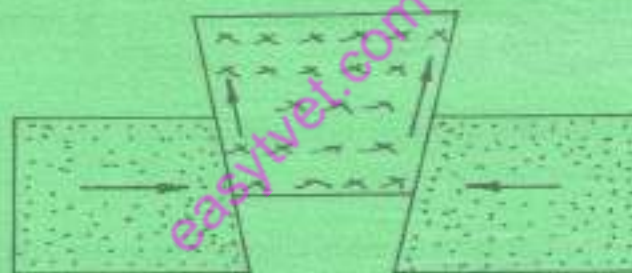


Fig. 3

Compression force ✓
Shear force
Tectonic force

Faulting

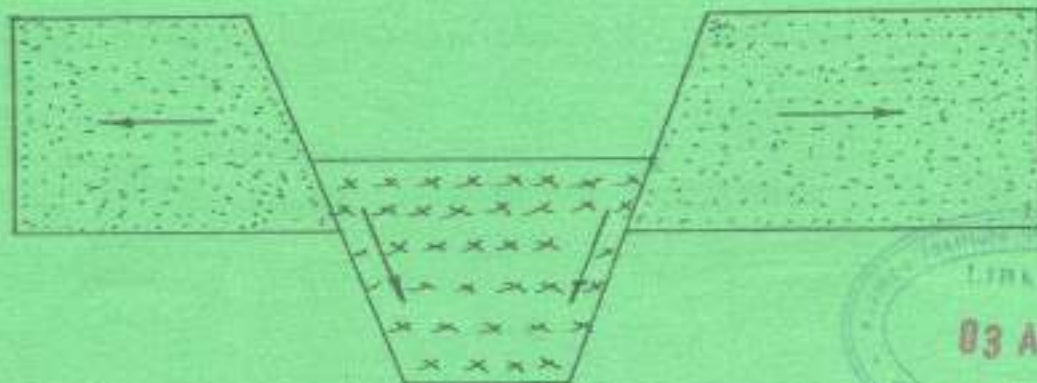


Fig. 4

- (c) With the aid of a labelled diagram, describe the formation of a recumbent fold. (6 marks) ✓



