

2528/201  
2922/201  
EARTH SCIENCE AND ENVIRONMENTAL  
INFORMATION SYSTEMS  
June/July 2016  
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;*

*A 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 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 6 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. (a) State the **four** levels of communication. (2 marks)
- (b) State the implication of the following in communication:
  - (i) positive feedback; → (1 mark)
  - (ii) negative feedback. (1 mark)
2. List **four** advantages of effective communication. (4 marks)
 

→ key in letter or depending  
→ fit
3. (a) Explain the term remote sensing. - on 3' scale of measuring energy out recording  
 (2 marks)  
 a phenomenon without physical presence
- (b) Differentiate passive remote sensing from active remote sensing. (2 marks)  
 passive → generate own energy  
 active
4. Figure 1 shows radar measurement of slant range  $R$  and elevation angle  $\theta$ . Determine height of target  $H$  above surface of the earth. (4 marks)

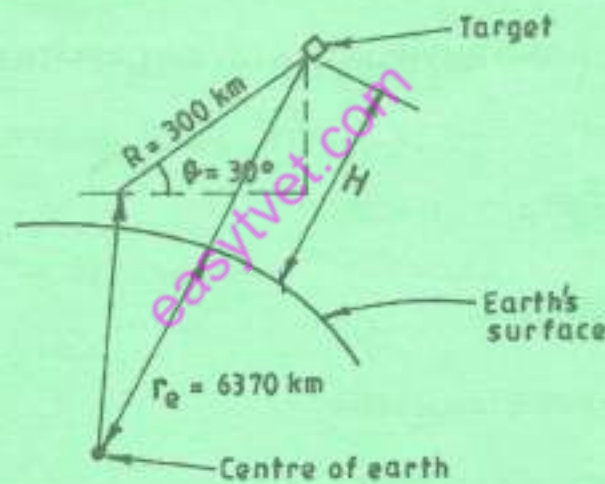


Fig. 1

5. Define the following terms as used in artificial satellites:
  - (a) geostationary orbit; → they are orbit which do not move. (1 mark)
  - (b) swath; (1 mark)
  - (c) near polar orbit; (1 mark)
  - (d) sun synchronous orbit. (1 mark)

6. Give **four** comparisons for sensors on board satellite and in air craft. (4 marks)

7. Explain the following terms in relation to plate tectonics.

(a) seafloor spreading; - it is the spreading of plates all over the floor. (2 marks)

(b) <sup>disjoined</sup> continental drift. - this is where there was joining but now it has <sup>separated</sup> (2 marks)

8. Figure 2 shows the lithospheric plate floating on the mantle. Determine the height of plate above surrounding mantle given that the density of lithosphere is  $2850 \text{ kg/m}^3$  and that of the mantle is  $3650 \text{ kg/m}^3$ . (4 marks)

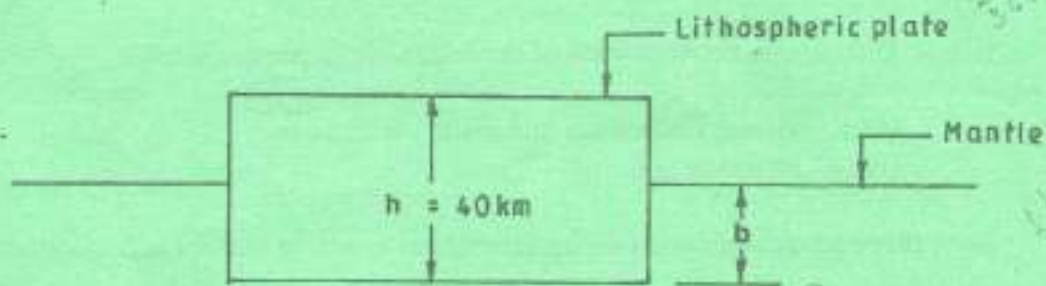


Fig. 2

9. With the use of diagrams, distinguish between a normal fault and a reverse fault. (4 marks)

10. Identify with a reason the types of folds in figures 3 and 4. (4 marks)



Fig. 3 Asymmetric



Fig. 4

Simple  
Clear

It increases in

SECTION B (60 marks)

Answer any THREE questions from this section.

11. (a) With the aid of a flow diagram, describe the three sub-systems of the basic communication system. *Transmitter - sender Receiver* (8 marks)
- (b) (i) Explain using a diagram, the term spectral signature as used in remote sensing and state its significance. (3 marks)
- (ii) Distinguish between each of the following in remote sensing:  
 (I) virtual verification and insitu verification; *moving - stationary* (2 marks)  
 (II) an image and a photograph. (2 marks)
- (c) State three advantages and two disadvantages of active sensors in remote sensing. *Advant Disadv* (5 marks)
12. (a) Define the following terms associated with satellites:
- (i) earth stations; (1 mark)
- (ii) transponder. (1 mark)
- (b) Name four types of satellite instruments and state the purpose for each. (6 marks)
- (c) (i) Describe the term dBZ as used in weather radar. (5 marks)
- (ii) State the Marshall-Palmer formula relating dBZ with rainfall rate. (4 marks)
- (iii) Determine the rainfall intensity for a dBZ value of 30 using the Marshall-Palmer formula. (3 marks)
13. (a) (i) List two uses of GPS. *- military purpose - meteorologists* (2 marks)
- (ii) Describe the three components of a GPS. *- space - area - user* (6 marks)
- (b) Explain four basic operations of image processing in GIS. (6 marks)

- (c) Explain each of the following GIS operating principles:
- (i) data capture; (2 marks)
  - (ii) data integration; (2 marks)
  - (iii) data structure. (2 marks)

14. (a) Define each of the following terms associated with plate tectonics:

- (i) oceanic trenches; (1 mark)
- (ii) slab pull; (1 mark)
- (iii) ridge push; (1 mark)
- (iv) asthenosphere; (1 mark)
- (v) lithosphere. (1 mark)

(b) With the aid of a diagram, explain the term subduction as used in plate tectonics. (4 marks)

(c) Explain:

- (i) five characteristics of minerals in Geoscience; (5 marks)
- (ii) six non-silicate mineral groups. (6 marks)

15. (a) Define the following terms as used in sedimentary rock structures:

- (i) sole mark; (1 mark)
- (ii) groove cast; (1 mark)
- (iii) skip mark; (1 mark)
- (iv) slide mark; (1 mark)
- (v) drag mark. (1 mark)

(b) Using diagrams, describe each of the following igneous intrusions:

- (i) lapolith; (3 marks)
- (ii) laccolith. (3 marks)

in limestone  
- granitic  
- white

5  
- 1705 will make a way  
- have there seem to be

easytvet.com  
- make me thinking  
- about before no surface

- (c) Figure 5 is a diagram of a volcano. Describe the parts labelled A, B, C, D, E and F. (9 marks)

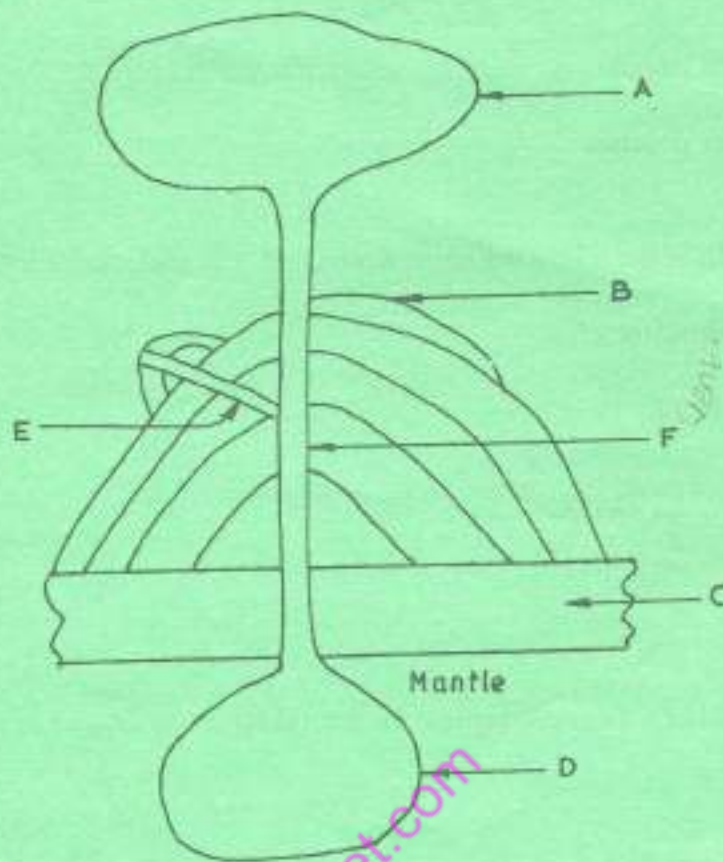


Fig. 5

THIS IS THE LAST PRINTED PAGE.