

**CHUKA**



**UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF  
PHYS 393/326: INTRODUCTION TO GEOPHYSICS**

**STREAMS:**

**TIME: 2 HOURS**

**DAY/DATE: TUESDAY 09/04/2019**

**11.30 A.M. – 1.30 P.M.**

**INSTRUCTIONS:**

- Answer question ONE and any other TWO questions

**QUESTION ONE (30 MARKS)**

1. (a) Define the following (3 marks)
- (i) Bulk stress
  - (ii) Rigidity modulus
  - (iii) Anomaly
- (b) Explain why Geophysical is preferred to borehole drilling in geological investigations. (4 marks)
- (c) State any three Geophysical methods that use natural field and give the physical properties to which each method responds to. (5 marks)
- (d) Compression ray travels with a velocity of  $2.1 \times 10^3 \text{ m/s}$  in a rock material of density  $267 \text{ kg/m}^3$  and at a velocity  $1.6 \times 10^3$  in a rock layer of density  $295 \text{ kg/m}^3$ , calculate its reflection coefficient. (5 marks)
- (e) State two types of seismic survey. (2 marks)
- (f) Explain briefly the principle behind electrical methods in geographical survey.

(4 marks)

- (g) Highlight the reasons as to why Geophysical methods are used in combination. (3 marks)
- (h) What is Geophysical anomaly? (2 marks)
- (i) Explain how resistivity varies with porosity (2 marks)

**QUESTION TWO (20 MARKS)**

- 2. (a) A geophysical survey is to be conducted to investigate the presence of salt dome at the coastal level. Explain based on the physical properties of salt, the appropriate geophysical techniques to be applied and the expected results. (9 marks)
- (b) Describe how to minimize the ambiguity in geophysical data interpretation. (5 marks)
- (c) Explain why data reduction is very important in geophysical survey. (3 marks)
- (d) Geophysical data is digitized before interpretation, explain. (3 marks)

**QUESTION THREE (20 MARKS)**

- 3. (a) The attraction exerted by the earth of mass ( $M_e$ ) to an object of mass m which is not held makes it fall with acceleration g. Derive an expression for g. (5 marks)
- (b) Explain the effect of ;
  - (i) Free air
  - (ii) Bouguer slab
 On gravity measurement (6 marks)
- (c) Describe any methods used to determine absolute gravity. (6 marks)
- (d) Explain qualitative interpretation of geophysical data. (3 marks)

**QUESTION FOUR (20 MARKS)**

- 4. (a) Explain the Nebular hypothesis for the origin of the solar system. (7 marks)
- (b) Describe how remanent magnetization is acquired by rocks (7 marks)
- (c) Explain giving examples the three different types of plate boundaries. (6 marks)

**QUESTION FIVE (20 MARKS)**

5. (a) Explain diurnal correction and how it is conducted in magnetic survey. (6 marks)
- (b) The eccentricity of the moon's orbit is 0.0549 and the mean orbital radius  
 $r = \frac{a+b}{2}$  is 384100 km
- (i) Calculate the lengths of the principle axes a and b of the moons orbit
- (ii) How far is the centre of the earth from the centre of the elliptical orbit? (8 marks)
- (c) Calculate the escape velocity of an object on the earth, assuming a mean gravitational acceleration of  $9.81 \text{ ms}^{-2}$  and mean earth radius of 6371 km. (6 marks)
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