



# TECHNICAL UNIVERSITY OF MOMBASA

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Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS AND PHYSICS

UNIVERSITY EXAMINATION FOR:

**BACHELOR OF TECHNOLOGY IN ENVIRONMENTAL PHYSICS & RENEWABLE  
ENERGY (BTRE)**

APS 4217: GEOPHYSICS

END OF SEMESTER EXAMINATION

**SERIES: MAY 2016**

**TIME: 2 HOURS**

## Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions.

Attempt question **ONE (COMPULSARY)** and any other **TWO** questions

**Do not write on the question paper.**

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## Question ONE (30 Marks)

- (a) Explain the term 'gravimeter drift'. (2mks)
- (b) Explain any two differences between P-wave and S-wave. (2mks)
- (c) Explain what is meant by IGRF and its importance in magnetic reduction (2mks)
- (d) Explain what is meant by 'non-uniqueness' of magnetic modeling and how this can be dealt with in exploration (2mks)
- (e) Define the following terms
  - (i) Diurnal variation. (2mks)
  - (ii) Koensberger ratio (2mks)
- (f) State any two disadvantages of Wenner array over Schlumberger array (2mks)
- (g) Describe the following types of Remanent magnetization
  - (i) Thermo Remanent magnetization (2mk)
  - (ii) Chemo Remanent magnetization (2mk)
  - (iii) Detrital Remanent magnetisation (2mk)
- (h) Give two reasons why most resistivity meter employ low frequency A.C than D.C. (2mks)
- (i) Explain two differences between oceanic and continental crust (4mks)
- (j) State and explain any two corrections done on magnetic data (4mks)
- (k) Briefly explain the term regional anomaly (2mks)

### Question TWO (20 Marks)

- (a) i. Describe the self-exciting dynamo theory on the origin of geomagnetic field (4mks)
  - ii. The source of external geomagnetic field is mainly in the ionospheric atmosphere. Briefly explain this. (4mks)
  - iii. With the aid of a diagram, define the magnetic elements necessary to fully describe magnetic field at a point on earth's surface. Show their relationship. (5mks)
- (b) i. Explain what is meant by local magnetic anomaly and clearly explain its distribution (3mks)
  - ii. Explain what is inferred in 'Qualitative and Quantitative' interpretation of magnetic data (4mks)

### Question THREE (20 Marks)

- (a) State the assumptions made in seismic refraction method. (4mks)
- (b) Derive the expression for direct and refracted travel times and overburden layer depth for a single horizontal interface. (12mks)
- (c) You wish to determine the depth to the water table before drilling a well. Using small explosions and seismographs, it is found that the P-wave velocity in the surface sediment is 300m/s and velocity in a subsurface layer presumably water is 750m/s. The intercept time is 0.4s. How deep is the water table? (4mks)

### Question FOUR (20Marks)

- (a) Draw a well-labelled cross-section of the internal structure of the earth showing the crust, mantle, outer and inner cores and transition zones. (5mks)
- (b) Discuss the principle of Magneto telluric (MT) and Static shift. (11mks)
- (c) Outline the two types of magnetometers, stating the component of the magnetic field each measures (4mks)

### Question FIVE (20Marks)

- (a) State three reasons why 'drift' correction is done on gravity data (3mks)
- (b) Explain the effects of terrain on gravity data. How is it corrected (4mks)
- (c) Why is Bouguer correction done on gravity data (2mk)
- (d) Write down the expression for complete Bouguer Anomaly (2mk)
- (e) i. Define gravity potential (2mks)
  - ii. Show that gravity potential  $V = -\frac{GM}{r}$  (3mks)
- (f) What inference may be made in qualitative interpretation of gravity data (4mks)