TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR DEGREE OF:

BACHELOR OF TECHNOLOGY IN RENEWABLE ENERGY (BTRE 13S)

APS 4217: GEOPHYSICS

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Mathematical tables*
- *Scientific Calculator*

This paper consist of **FIVE** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Explain the term "gravimeter drift" **(2 marks)**

b) Explain any TWO differences between P-wave and S-WAVE **(2 marks)**

c) Explain what is meant by IGRF and its importance in magnetic reductions **(2 marks)**

d) Explain what is meant by 'non-uniqueness' of magnetic modeling and how this can be dealt with in exploration **(2 marks)**

e) Define the following terms:
(i) Diurnal variation
(ii) Koensberger ratio **(2 marks)**

f) State any TWO disadvantages of Wenner array over Schlumberger array **(2 marks)**

g) Describe the following types of remanent magnetization:
- **(i)** Thermo remanent magnetization (TMR)
- **(ii)** Chemical remanent magnetization (CRM)
- **(iii)** Detrital remament magnetization (DRM) **(3 marks)**

h) Give TWO reasons why most resistivity meters employ low frequency A.C rather than D.C **(2 marks)**

i) Explain THREE differences between oceanic and continental crust **(3 marks)**

j) State and explain any TWO corrections done on magnetic data **(4 marks)**

k) Briefly explain the meaning of the following terms:
- **(i)** Lithosphere
- **(ii)** Asthenosphere
- **(iii)** Reference ellipsoid **(6 marks)**

Question Two

a) (i) Describe the self-exciting dynamo theory on the origin of geomagnetic field **(4 marks)**

(ii) The source of external geomagnetic field is mainly in ionospheric atmosphere. Briefly explain **(4 marks)**

(iii) With aid of a diagram, define the magnetic elements necessary to describe fully magnetic field at a point on earth's surface. Show the relationship between horizontal and vertical components **(5 marks)**

b) (i) Explain what is meant by local magnetic anomaly and clearly explain its distribution **(3 marks)**

(ii) Explain what is inferred in 'Qualitative' and 'Quantitative' interpretation of magnetic data **(2 marks)**

(iii) Outline any TWO short comings of magnetic method in exploration **(2 marks)**

Question Three

a) State the assumptions made in seismic refraction method. **(4 marks)**

b) Derive the expression for direct and refracted travel times for a single horizontal interface showing how seismic velocity and depth of strata may be determined **(10 marks)**

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 0.4seconds. how deep is the water table? **(4 marks)**

d) What is the significance of the cross-over distance **(2 marks)**

Question Four

a) Draw a well-labeled cross-section of the internal structure of the earth showing the crust, mantle, outer and inner cores and transition zones **(3 marks)**

b) Discuss the principle of the following EM methods:
   (i) Magnetotelirics(MT)
   (ii) Transient Electromagnetic Method (TEM) **(10 marks)**

c) Define the following terms as used in magnetic:
   (i) Trend analysis (regional analysis)
   (ii) Forward modeling **(4 marks)**

d) Outline the THREE types of magnetometer and the magnetic field component each measures **(3 marks)**

Question Five

a) State THREE reasons why 'drift' corrections are done on gravity data **(3 marks)**

b) Explain the effects of Terrain on gravity data. How is it corrected **(6 marks)**

c) Write down the expression for complete Bouguer anomaly **(1 mark)**

d) Distinguish between regional and local anormaly **(2 marks)**

e) (i) Define gravity potential **(2 marks)**

$$V = -\frac{GM}{v}$$

   (ii) Show that gravity potential **(4 marks)**

f) Compare gravity at the poles and equator of the earth **(2 marks)**