KISII UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF
THE DEGREE OF BACHELOR OF SCIENCE GEOPHYSICS & MINERALOGY
SECOND SEMESTER 2022/2023
(JUNE - SEPTEMBER, 2022)

BSMN 222: APPLIED GEOPHYSICS 1

STREAM: Y2 S2 **TIME: 2 HOURS**

DAY: FRIDAY, 3:00 PM – 5:00 PM **DATE: 09/09/2022**

INSTRUCTIONS

1. ***Do not write anything on this question paper.***
2. ***Answer Question ONE (compulsory) and any other TWO questions.***

QUESTION ONE

(a)

i. State Newton's law of Universal gravitation (1mark)
ii. Acceleration due to gravity on the Earth's surface is latitude. Explain this statement (3marks)
iii. Explain the term gravimeter drift (1 mark)
iv. Explain what is inferred in Qualitative and Quantitative interpretation of gravity (2marks)
v. Explain what is meant by non-uniqueness of gravity modeling and how this can be dealt with in an exploration process. (4marks)

(b)

i. Explain the following terms
Magnetic susceptibility (4marks)
Remnant magnetization (4marks)

ii. Outline the advantage and disadvantages of aeromagnetic survey when compared to ground magnetics. (4marks)

(c)

i. Calculate the force of agravity in a women of mass 50kg, standing $6.38x10^6$m from the centre of Earth of mass $5.98x10^{24}$kg. (3marks)

ii. Explain with aid of equations the effect on gravity by
Earth's shape (3marks)
Earth's rotation on its own axis (3marks)

iii. Calculate the depth of penetration of electromagnetic fields with frequencies of 10, 500 and 2000Hz in a wet limestone with a conductivity of $2.5x10^{-4}$ S/m (4marks)

QUESTION TWO

(a)

i. With aid of diagram, explain the working principle of a gravimeter (4marks)

ii. Show that gravity at a height h metre above the surface of the reference ellipsoid is given by
$g_h – g_o(1- \frac{2h}{R})$
Where g_h and g_o represent gravity at a height h and at the reference ellipsoid respectively (3marks)

iii. The data below was collected using a gravimeter with a dial constant of 0.0869 mgals/ dial division. Plot a drift curve and make drift correction for the four stations in mgals (4marks)

Station	Time	Reading in dial/division	Scale value(mgal)
Base	11:20	762.71	66.28
St .1	11:42	774.16	67.27
St.2	12:14	759.72	66.02
St.3	12:37	768.95	66.82
St.4	12:59	771.02	66.00
Base	13:10	761.18	66.15

(b)

i. Outline the necessary gravity reductions applied to raw gravity data resulting to complete bouguer anomaly (CBA) (6 marks)
ii. At appoint whose latitude = 300 N elevation h= 600m above the sea level, the value of observed is 97952 mgals. Calculate the simple bouguer anomaly in mgals. (3marks)

QUESTION THREE

(a)

i. Explain the following terms (10 marks)

Magnetic potential
Magnetic moment
Secular variation
Magnetic storm
Paleomagnetism

ii. With the aid of diagram define elements of the geomagnetic field (3marks)

(b)

i. Explainthe working principle of a proton magnetometer (3marks)
ii. Describe limiting depth method used in estimating depth to magnetic source (4marks)

QUESTION FOUR

i. Describe basic theory of magnetic survey (10marks)
ii. Briefly explain field procedures involved in magnetic survey(5marks)
iii. Explain how magnetic survey is applied to Iron exploration (5marks)

QUESTION FIVE

i. Describe basic theory of Resistivity survey (10marks)
ii. Briefly explain field procedures involved in Resistivity survey (5marks)
iii. Explain how Resistivity survey is applied to Copper exploration (5marks)