

CHUKA



UNIVERSITY

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**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
SCIENCE IN GEOPHYSICS**

GPHY 345: GRAVITY AND MAGNETIC METHODS

STREAMS: BSC. GPHY

TIME: 2 HOURS

DAY/DATE: FRIDAY 25/04/2025

8.30 A.M. – 10.30 A.M.

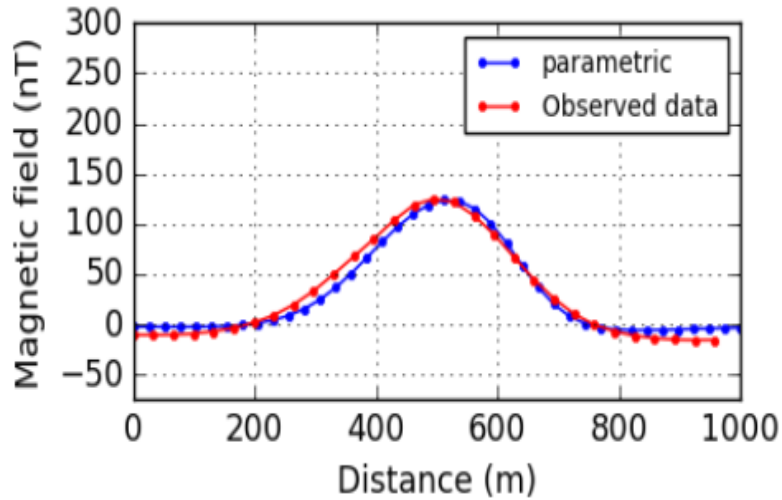
INSTRUCTIONS

- *Attempt ALL questions in section A and any other two questions from section B.*

SECTION A

Question One (Compulsory): (30 marks)

- Explain briefly why the earth's gravity field is not the same at all points on the earth's surface [3 marks]
- Explain briefly the steps to follow in the interpretation of magnetic or gravity data [6 marks]
- Describe elements of geomagnetic field [4 marks]
- Explain how regional trend is removed from the observed gravity anomaly [5 marks]
- Name the physical property under investigation in magnetic survey, how is it measured? [3 marks]
- Show how to arrive at complete Bouguer anomaly in gravity survey [3 marks]
- The figure below shows a magnetic profile obtained across an anomaly caused by a pipe model. Use the profile to estimate the depth of burial of the pipe using half-width method [6 marks]



SECTION B: Answer any two questions in this section

Question Two: (20 marks)

- a) Explain briefly the meaning of the following **FOUR** terms
 - i) Remanent magnetization
 - ii) Ferromagnetism
 - iii) Diurnal magnetic correction
 - iv) Residual magnetic anomaly [4 marks]
- b) Explain how to conduct qualitative interpretation of magnetic data [8 marks]
- c) Explain the source of ambiguity in potential data interpretation [4 marks]
- d) Highlight any four areas of application of magnetic survey [4 marks]

QUESTION THREE (20 MARKS)

a) A gravity station has the following details

Latitude	Longitude	Height	Observed gravity
37.5 ^o	175 ^o	600 m	979948.6

Using an average crustal density of 2670 kg/m³ calculate the free air and Bouguer anomalies for the station in milligals [11 marks]

- b) What is forward modelling, explain the forward modelling procedure [5 marks]
- c) The value of gravity at the pole (g_p) and at the equator (g_e) is equal to 984.221 Gal and 978.049 Gal respectively. Explain the difference [4 marks]

QUESTION FOUR (20 MARKS)

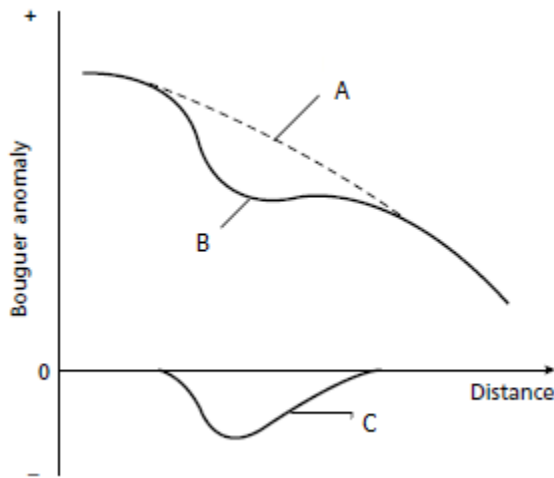
a) The attraction exerted by the earth of mass (M_e) to an object of mass m which is not held makes it fall with acceleration g . Derive an expression for g [5 marks]

- b) Explain the effect of ; i) Free air
 ii) Terrain
 iii) Bouguer slab

On gravity measurement [6 marks]

c) Describe any method used to determine absolute gravity [6 marks]

d) Name the anomalies A, B and C [3 marks]



QUESTION FIVE (20 MARKS)

a) Discuss the following remanent magnetization processes

- i) Isothermal remanent magnetization (IRM)
- ii) Chemical remanent magnetization (CRM)
- iii) Detrital remanent magnetization (DRM) [6 marks]

b) Explain how diurnal correction is conducted in magnetic survey [6 marks]

c) Describe two external factors that cause geomagnetic field variations [4 marks]

d) Derive the expression for the free air correction factor [4 marks]

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