

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN IN  
PHYSICS

GPHY 352: GEOPHYSICAL DATA ANALYSIS AND INTERPRETATION

STREAMS: BSC

TIME:2 HOURS

**DAY/DATE: TUESDAY 17/12/2024**

**8.30 A.M. –10.30 A.M.**

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Useful constants

Universal gravitational constant  $G=6.67 \times 10^{-11} \text{ m}^3/\text{kg}^2$

Density of crustal material  $=2670 \text{ kg/m}^3$

Mean radius of the earth  $R_e=6400 \text{ km}$

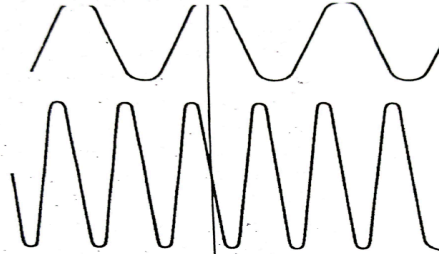
Acceleration due to gravity  $g=9.8 \text{ m/s}^2$

Mass of the earth  $M_e=6 \times 10^{24} \text{ kg}$

***Answer question one and any other three questions***

**QUESTION ONE (30 MARKS)**

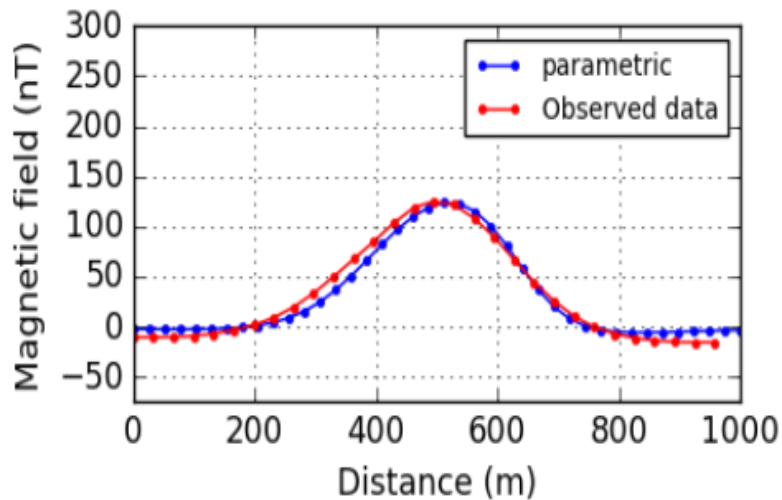
- a) i) Define digitization of geophysical data [3Marks]
- ii) State the two basic parameters of a digitizing system [2Marks]
- b) Highlight the difference between periodic and transient waveforms [2Marks]
- c) State and explain the two ways in which periodic waveforms can be expressed [4Marks]
- d) Draw the amplitude spectra of the waveforms below in spectral analysis [5Marks]



- e) Explain briefly how regional trend is removed from the observed gravity anomaly[4Marks]
- f) Discuss the two types of geophysical data interpretation [6Marks]
- g) Describe how to minimize the ambiguity in the interpretation of potential field geophysical methods [4Marks]

**QUESTION TWO (20 MARKS)**

- a) Discuss any three areas of application of magnetic geophysical surveying technique[6Marks]
- b) 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;
  - i) half-width method [7Marks]
  - ii) Gradient-amplitude ratio method [7Marks]



**QUESTION THREE (20 MARKS)**

- a) Explain how a dipping interface is detected in seismic refraction [5Marks]
- b) State the limitations of seismic reflection method in petroleum exploration [3Marks]

c) The table below shows a seismic refraction data along a proposed airport runway. Interpret the data and generate the geologic model along the proposed runway. What are your observations give appropriate advice? [12Marks]

Offset (m)	Travel Time (ms)	Offset (m)	Travel time (ms)
0	0.0	190	21.7
30	5.0	210	23.2
50	9.0	230	24.6
70	13.2	260	32.2
90	16.2	280	33.9
110	17.2	300	35.2
130	18.0	320	36.5
150	19.6	340	37.7
170	20.7	360	39.2

**QUESTION FOUR (20 MARKS)**

a) Explain the following methods of geophysical data processing

i) Convolution

[4Marks]

ii) Deconvolution

[4Marks]

b) What is forward modelling, explain the forward modelling procedure

[6Marks]

c) Discuss the two main types of digital filters

[6Marks]

**QUESTION FIVE (20 MARKS)**

a) Differentiate between regional and residual anomalies

[4Marks]

b) Describe the inverse problem in gravity data interpretation

[6Marks]

b) a) The following gravity contour map was obtained from a survey. Considering the profile AB' give the qualitative interpretation of the anomaly

[10Marks]

