

CHUKA



UNIVERSITY

**UNIVERSITY EXAMINATIONS**

**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELORS OF SCIENCE**

**GPHY 343: INTRODUCTORY GEOPHYSICS**

**STREAMS: BSc**

**TIME: 2 HOURS**

**DAY/DATE: MONDAY 09/12/2024**

**11.30 A.M. – 1.30 P.M.**

**INSTRUCTIONS:**

- **Answer question ONE (30 marks) and any other TWO questions (Each 20marks)**
- **Do not write on the question paper**

**QUESTION ONE (30MKS)**

- Discuss the factors to be considered when selecting an appropriate Geophysical survey method. [3 marks]
- Giving examples, differentiate between active and passive methods in Geophysical techniques. [2 marks]
- Highlight the reasons as to why Geophysical methods are used in combination. [3 marks]
- Discuss what is meant by data reduction in Geophysical data processing. [2 marks]
- Explain the use of gravity survey in determining the depth of a bedrock. [4 marks]
- Explain what is drift and how it can be minimized in a gravimeter. [2 marks]
- Briefly explain what is geomagnetic correction in magnetic data processing. [2 marks]
- With the aid of a diagram, explain the principle of seismic refraction. [5 marks]
- State the limitations of seismic reflection method in petroleum exploration. [3 marks]
- Distinguish between body waves and surface waves in reference to seismic survey. [2 marks]
- State two limitations of the resistivity method in geophysical exploration. [2 marks]

**QUESTION TWO (20 MARKS)**

- a) What causes ambiguity in the interpretation gravity survey data and how is it minimized? [4 marks]
- b) Explain what is meant by gravity anomaly? [2 marks]
- c) Discuss any 3 factors affecting gravitational acceleration measured at any point on the earth's surface. [6 marks]
- d) Describe the steps in Gravity data processing. [5 marks]
- d) Explain what is meant by Bouguer correction in gravity survey method? [3 marks]

**QUESTION THREE (20 Marks)**

- a) List two applications of magnetic surveying. [2 marks]
- b) Discuss the causes of magnetic anomalies. [4 marks]
- c) Describe the elements of a geomagnetic field. [5 marks]
- d) Explain how seismic waves are generated in a rock formation. [4 marks]
- e) Describe how head waves are generated in seismic refraction. [5 marks]

**QUESTION FOUR (20 Marks)**

- a) State any four assumptions made in deriving travel time equation for seismic refraction. [4 marks]
- b) Derive the time-distance equation for a refracted seismic wave traversing a two-layer geosection. [5 marks]
- c) Table 2 below shows arrival times for direct and refracted waves in a 2-layer refraction seismic experiment

Distance from shot point (m)	Direct wave time (ms)	Refracted wave time (ms)
0	0	13.58
6	4.29	14.91
12	8.57	16.24
18	12.86	17.58
24	17.14	18.91
30	21.43	20.24
36	25.71	21.58
42	30.00	22.91
48	34.29	24.24
54	38.57	25.58
60	42.86	26.91
66	47.14	28.24

- i) Plot a travel time graph [4 marks]
- ii) Find velocities  $V_1$  and  $V_2$  in the two layers [4 marks]
- iii) Find the cross over distance and use it to calculate depth of the over-burden [3 marks]

**QUESTION FIVE (20 Marks)**

- a) Distinguish between electrical drilling and electrical profiling. [4 marks]
- b) Werner and Schlumberger electrode configurations are the main electrode arrangements used in resistivity investigations. Sketch the four electrode configurations in electrical resistivity survey for these modes. [6 marks]
- c) Discuss the limitation of Werner configuration and explain how Schlumberger electrode configurations overcomes it. [2 marks]
- d) Derive the fundamental equations for each electrode arrangement. [4marks]
- e) Using any one electrode arrangement discuss how vertical electrical surveying can be conducted. [4 marks]

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