



UNIVERSITY OF RUHUNA

FACULTY OF FISHERIES AND MARINE SCIENCES & TECHNOLOGY

Academic Year 2023/2024

Bachelor of Science Honours in Marine and Freshwater Sciences Degree

Level III Semester I Examinations – April/May 2025

OCG 3122: Geophysics for Marine Sciences

Answer all Questions

Part B

1.

- a) Describe in detail, using labeled diagrams, how to acquire 2D marine seismic data. (10 Marks)
- b) Explain step by step how to convert shot gathers acquired during the survey into an interpretable seismic profile. (15 Marks)

2.

- a) Derive the mathematical expression for the **Free Air anomaly** at land. Start with the formula for gravity at a given point due to a mass at a height h above the earth's surface. (08 Marks)
- b) Derive the mathematical expression for the **Bouguer anomaly** at land. Begin by considering the contribution of the Bouguer plate correction, which compensates for the mass of material between the measurement point and sea level and explain how this anomaly accounts for the effects of the earth's topography and density of surface materials. (08 Marks)
- c) A gravity survey is conducted over a region with a mountainous terrain, where the goal is to investigate subsurface density variations, including the crustal thickness and possible fault zones. The Bouguer anomaly and Free Air anomaly data are recorded along a profile traversing the region. You are provided with the following data for the observed gravity anomalies at various locations.

Location (km)	Free Air Anomaly (mGal)	Bouguer Anomaly (mGal)
0	120	100
5	115	105
10	110	100
15	98	85
20	95	88
25	92	90
30	85	80

- i. Plot the Free air anomaly and Bouguer anomaly in same graph. Use graph paper for plot the anomalies. Explain the difference between the Free air anomaly and the Bouguer anomaly and describe why the Bouguer anomaly is typically used in studies of subsurface structures. (04 Marks)
- ii. The Bouguer anomaly shows a low gravity value near the center of a mountainous region (at 15 km). Explain how this anomaly might indicate the presence of an anomalous structure, such as a fault zone, deep crustal root, or mantle anomaly, and how you could further investigate the cause of the anomaly. (05 Marks)

3. Write short notes on any five (05) of the following

- a) LiDAR method and its applications
- b) Sonar method and its applications
- c) Seismic stacking and its advantages
- d) Forward and inverse modelling
- e) Data reduction steps in gravity
- f) Apparent resistivity

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