UNIVERSITY OF RUHUNA

FACULTY OF FISHERIES AND MARINE SCIENCES & TECHNOLOGY

Academic Year 2022/2023

Bachelor of Science Honours in Marine and Freshwater Sciences Degree

Level III Semester I Examinations – July 2024

OCG 3122: Geophysics for Marine Sciences

Part B

Answer only three (03) Questions including the Question No. 01

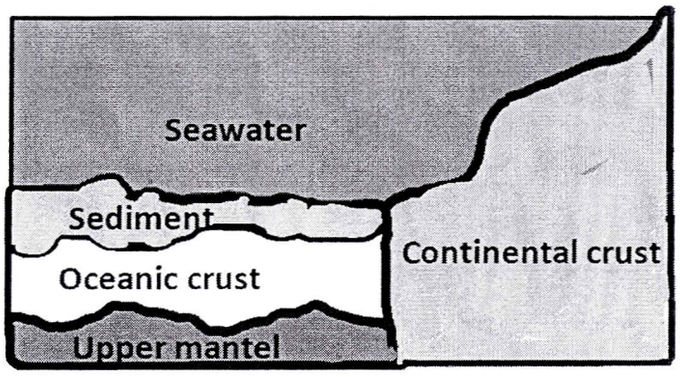
1. Using labeled diagrams, explain step by step how one would generate a model of the Earth's subsurface utilizing seismic waves. **(25 Marks)**

2. Describe in detail the applications of SONAR, LIDAR, and GPR techniques in marine sciences. Use labeled diagrams where necessary. **(25 Marks)**

3. You have been appointed as the geophysicist in charge of a project to demarcate the boundary between the continental and oceanic crust beneath Sri Lanka, aiming to understand the crustal architecture. Assume that the continental-oceanic boundary (COB) is a sharp boundary with no transition zone. A comprehensive geophysical project involves addressing the following key questions:
   - What is the problem?
   - What are the important physical property contrasts?
   - What is the best survey method?
   - What mode of data will be collected, spacing, frequency, airborne, ground, etc.?
   - What is the best way to process the data (data reductions methods)?
   - What is the interpretation methodology?

   i. Bearing in mind that not all projects explicitly address these questions, provide detailed answers to above question from a to f for this specific case (seismic surveys are not allowed due to the use of blasting sources). (20 Marks)

   ii. Additionally, given the figure showing the shape of the continental crust and oceanic crust boundary observed in Sri Lanka, draw the expected shape of the signal obtained across this boundary using your survey methods. (05 Marks)



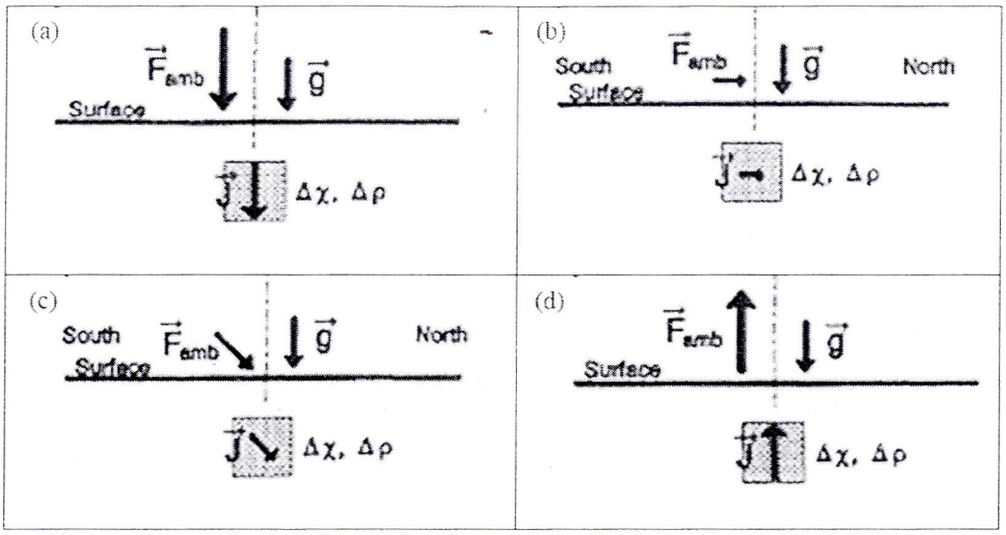
4.

i. What is induced magnetization? (05 Marks)

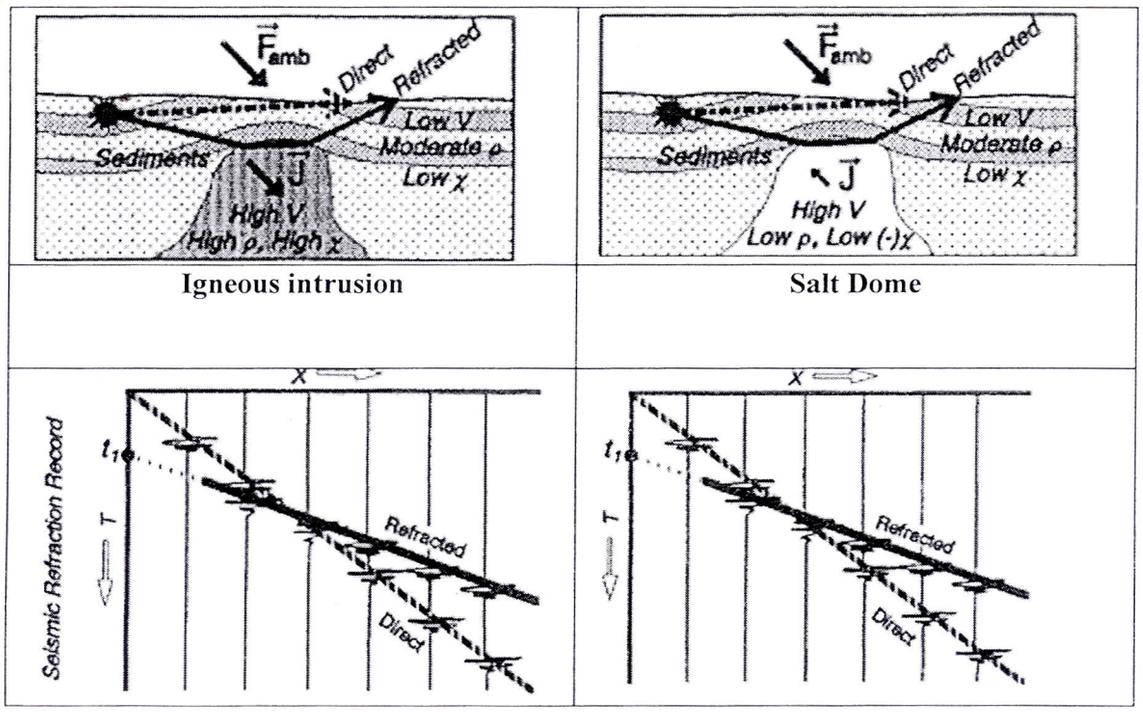
ii. Briefly explain the types of induced magnetic behaviors? (06 Marks)

iii. Draw the shapes of the gravity and magnetic anomaly for the following cross sections. (08 Marks)

$\bar{F}_{amb}$ = Earth ambient field direction, $\bar{g}$ = Gravitational acceleration direction, $\bar{J}$ = Magnetization direction



iv. A refraction seismic survey was conducted to identify a salt dome at the ocean bottom, and it is speculated that dykes are also located in the vicinity. The following figure shows the refraction seismic survey records of the dyke and the salt dome.



(05 Marks)
(06 Marks)
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Geophysicists have discussed the situation and have proposed three survey methodologies:

A. Conducting a gravity survey
B. Conducting a magnetic survey
C. Conducting both gravity and magnetic surveys

a. Draw the magnetic and gravity anomalies for both structures (dyke and salt dome). (04 Marks)

b. Considering effectiveness and cost-effectiveness, explain your suggested methodology among A, B and C for the above task. (02 Marks)

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