

CHUKA

UNIVERSITY



UNIVERSITY EXAMINATIONS

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

GPHY 443: SEISMIC REFLECTION METHOD

STREAMS: BSC. GPHY

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 16/04/2025

11.30 A.M. – 1.30 P.M.

INSTRUCTIONS

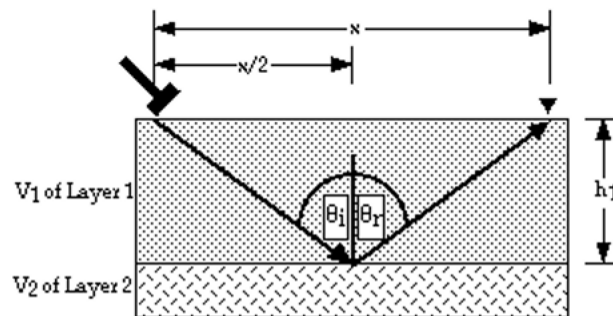
- Attempt ALL questions in section A and any other two questions from section B.

SECTION A

Question One (Compulsory): (30 marks)

a) Show that the travel time for a single reflecting horizontal interface is given by [6 marks]

$$t = \frac{(x^2 + 4h_1^2)^{1/2}}{V_1}$$



b) Define the following terms in seismic reflection

- Normal moveout
- Data migration
- Reverberation

[3 marks]

- c) Explain how multichannel reflection profiling is conducted [5 marks]
- d) Highlight the two advantages of common depth point (CDP) profiling and stacking [2 marks]
- e) Explain why it is necessary to conduct static correction in seismic reflection [4 marks]
- f) State any THREE data filtering methods in reflection data processing [3 marks]
- g) What is a seismic trace, and how is it used in seismic interpretation? [4 marks]
- h) Explain the concept of a Common Midpoint (CMP) gather and its significance in seismic data processing [3 marks]

SECTION B: Answer any two questions in this section

Question Two: (20 marks)

- a) State the importance of stacking [3 marks]
- b) Discuss the TWO common shot-detector configuration in multichannel reflection profiling surveys [8 marks]
- c) Differentiate between primary reflection and multiple reflection [2 marks]
- d) Explain how seismic reflection surveying is used in hydrocarbon exploration? [7 marks]

QUESTION THREE (20 MARKS)

a) The table below shows results obtained from a seismic reflection survey. Use it to answer the questions below;

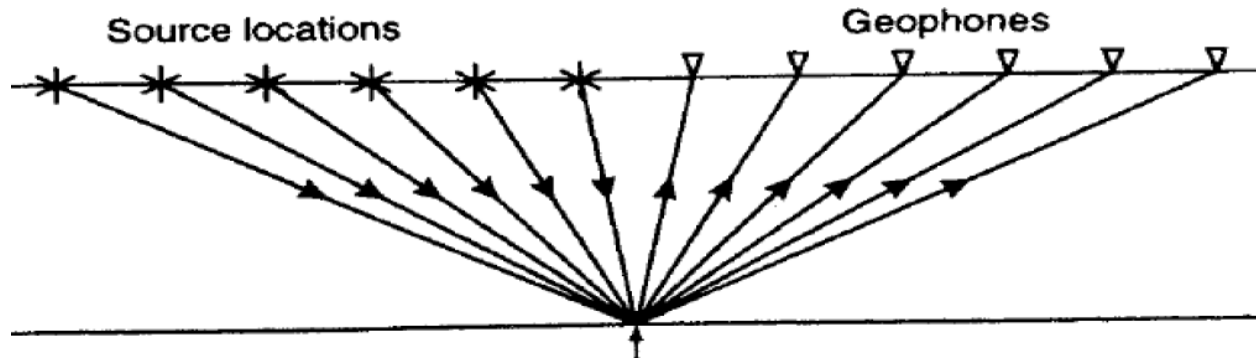
Distance (m)	Time (ms)
15	50.7
25	51.9
35	53.6
45	55.9
55	58.6
65	61.7
75	65.1
85	68.8
95	72.7
105	76.8
115	81.1
125	85.6

- i) Plot a graph of t^2 against x^2 [6 marks]

- ii) Use the graph to obtain velocity and depth [10 marks]
- b) Explain how stacking velocity is obtained in a seismic reflection survey [4 marks]

QUESTION FOUR (20 MARKS)

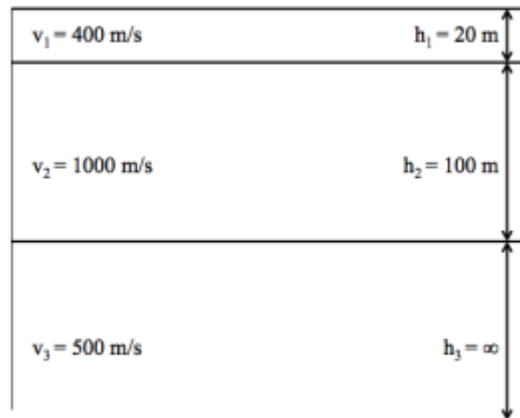
- a) Identify the gather in the diagram below and explain how it is conducted [5marks]



- b) Explain any two reasons as to why the above gather is important in seismic reflection [4 marks]
- c) Explain any of the filters in reflection data processing [6 marks]
- d) Describe the process of seismic data migration [5 marks]

QUESTION FIVE (20 MARKS)

- a) Discuss the application of seismic reflection in stratigraphic analysis [10 marks]
- b) Consider the three layer earth described below. All layers have the same density.



- i) Consider the reflection from the top of layer 2: What is the travel time for that reflection event and what is the value of the reflection coefficient? Assuming the seismogram would be obtained at zero offset. [4 marks]
 - ii) Consider the reflection from the top of layer 3. What is the travel time for that reflection event and what is the value of the reflection coefficient?[3 marks]
 - iii) Compute the transmission coefficients associated with waves that travel through the first interface; that is, the transmission coefficients for the downward and upward travelling waves. [3 marks]
-