**ELIZADE UNIVERSITY**
**FACULTY OF BASIC AND APPLIED SCIENCES**
**DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES**
**PROGRAMME: APPLIED GEOPHYSICS EXAM TITLE: DEGREE EXAMINATION**
**COURSE CODE & TITLE: AGP 423 – ENVIRONMENTAL GEOPHYSICS**
**TIME ALLOWED: 2 ½ hrs SEMESTER/SESSION: FIRST / 2020/2021**
**INSTRUCTIONS: Answer QUESTIONS 2, 4 AND 5 and any other ONE question.**
*Write your **matriculation number** only on your answer script(s) and NOT your name*

**HOD's SIGNATURE**

1. (a) Define environmental geophysics.
   (b) Environmental and engineering geophysics are areas of specialization in geophysics. Highlight the principal distinctions between both specializations.
   (c) State **five** geophysical methods that can be employed for environmental work.
   (10 marks)

2. (a) Carefully study the geoelectric models from a typical Basement Complex environment in Figure 1. Identify which of these models has low vulnerability to groundwater pollution from possible surface contaminants from anthropogenic activities. Give reasons for your choice.

   (b) (i) For each of the models, identify the main aquifer layers and state their geoelectric parameters in terms of thickness and resistivity values.

   (ii) What are the relevance and implications of Longitudinal Conductance and Transverse Resistance in groundwater vulnerability studies. State their empirical formulae and define all terms.

   (c) For both models, calculate the total longitudinal conductance (S), and total traverse resistance (T) of the layers above the aquifers. (18 marks)

3. (a) The greatest single environmental problem connected with petroleum production is oil spillage. List **five (5)** environmental problems often associated with oil spillage; with particular reference to the environmental implications on the ecosystem. Briefly discuss any **two (2)** of these problems.

   (b) Briefly highlight **four (4)** major reasons the electromagnetic method (EM) could be considered a useful investigation tool in an extensively polluted/contaminated environment.

   (c) Explain the term "salt water intrusion".

   (10 marks)

4. (a) Briefly discuss the impacts of human activities upon the environment.

   (b) Corroded steel drums containing toxic chemicals were buried at depth at various unidentified locations within an environment. A proposed construction activities involving excavation

activities at the site is likely to pose the risk of puncturing these drums; which may result in serious threat to lives.

(i) What geophysical method would be the best choice to be used in locating the drums?

(ii) Briefly explain the principle of the method.

(iii) Show a typical profile over the steel drums based on the method you considered most appropriate.

(14 marks)

5. (a) What is your understanding of soil corrosivity?

(b) Which geophysical method would you adopt to determine the degree of soil corrosivity as pre-investigation for installation of industrial metal pipes? How do you interpret your measurements?

(c) Consider that the soil types in the Table below are from fresh water saturated environment, rate their degree of corrosivity by completing the table below, using the terms: High, Moderate, Low, Very low.

| **Soil Type** | **Degree of Corrosivity** |
|---|---|
| Sandy Clay | |
| Clayey Sand | |
| Clay | |
| Sand | |

(18 marks)

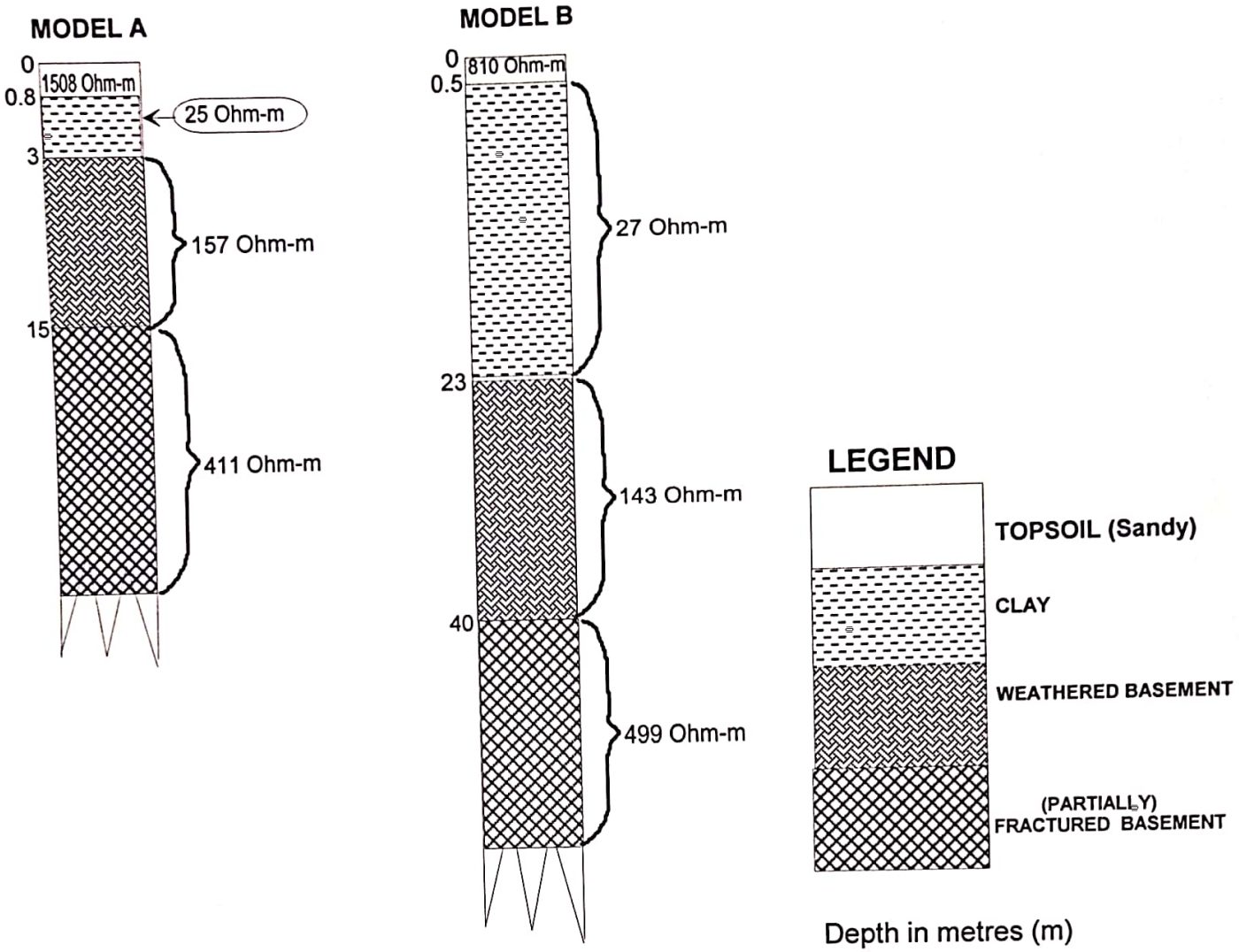
MODEL A
0
1508 Ohm-m
0.8
25 Ohm-m
3
157 Ohm-m
15
411 Ohm-m
MODEL B
0
810 Ohm-m
0.5
27 Ohm-m
23
143 Ohm-m
40
499 Ohm-m
LEGEND
TOPSOIL (Sandy)
CLAY
WEATHERED BASEMENT
(PARTIALLY) FRACTURED BASEMENT
Depth in metres (m)

**Figure 1**