ELIZADE UNIVERSITY
FACULTY OF BASIC AND APPLIED SCIENCES
DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES
PROGRAMME: APPLIED GEOPHYSICS EXAM TITLE: DEGREE EXAMINATION
COURSE CODE & TITLE: AGP 307: Self Potential, Induced Polarization and Electrical Resistivity Methods
TIME ALLOWED: 2½ hrs SEMESTER/SESSION: FIRST / 2018/2019
INSTRUCTIONS: ANSWER FOUR (4) QUESTIONS IN ALL.
*Write your **matriculation number** only on your answer script(s) and NOT your name*

HOD's SIGNATURE

SECTION A: Answer Question 1 and any other Question from this section

1. (a) Table 1 is a Vertical Electrical Sounding (VES) data.
   (i) Plot the data.
   (ii) Through partial curve-matching, evolve the geoelectric model parameters from the field data.
   (iii) Draw a columnar section from the geoelectric model parameters derived from your interpretation.
   (iv) Which geologic environment does the data typify?

Table 1: VES Data

AB/2 (m)	1	2	3	4	5	7	10	15	20	30	40	50	70	100	150	200	300
Apparent Resistivity (Ω-m)	14	14	14	15	15	18	23	31	37	50	57	64	75	83	80	63	45

   (b) (i) From a well labelled sketch of a typical four electrode array, derive an expression which relates apparent resistivity to electrode separation for Schlumberger configuration.
   (ii) Outline at least **five (5)** types of electrode configurations that are commonly employed in resistivity surveying.

(18 marks)

2. (a) Discuss the electrode array systems adopted in Self Potential (SP) method and state at least **two (2)** operational advantages and disadvantages of each of them
   (b) State **five (5)** factors influencing the resistivity of the earth materials.

(12 marks)

3. (a) Discuss **five** applications of the Electrical Resistivity Method.
   (b) State the natural or geologic noise in SP survey and explain how they could be reduced or corrected.

(12 marks)

SECTION B: Answer Question 4 and any other Question from this section

4. (a) (i) Discuss the Sato and Mooney electrochemical half-cell theory. Support your discussion with appropriate diagram.
   (ii) State **two (2)** limitations of the theory.

   (b) (i) How does IP effect manifest in both frequency domain and time domain?

   (ii) With clearly drawn diagram(s) and using the model of electric circuit equivalence of an electrode polarization, show that in frequency response domain,

$$R_{eq} = R_o \left(\frac{b}{1+b}\right).$$

(18 marks)

5. (a) Discuss **three (3)** applications of the Induced Polarization method.
   (b) What do you understand by resistivity type curve? Give **five (5)** examples of resistivity type curves with their respective layer resistivity combinations.

(12 marks)

6. (a) Name the different types of Induced Polarization (IP) and the rock in which they are pronounced.
   (b) Discuss the field procedures and data presentation of the Self Potential method.

(12 marks)