**

**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**FACULTY OF SCIENCES**

**DEPARTMENT OF ENVIRONMENTAL SCIENCES**

**Plot 91, Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja**

**JULY 2018 EXAMINATIONS**

**COURSE: ESM341 Credit UNIT: 2 TIME ALLOWED:** 2 Hours

**COURSE Title:** *INTRODUCTION TO INSTRUMENTATION MEASUREMENTS AND FIELD METHODS IN ENVIRONMENTAL SCIENCE.*

**Instruction:** Attempt question number ONE (1) and any other THREE (3) questions. Question number one (1) is compulsory and carries 25 marks, while the other questions carry equal marks (15) each

1 a. Define the following:

1. Instrumentation. 2mks
2. Specialized techniques. 2mks
3. Universal techniques. 2mks

b. i. List 4 examples of field and laboratory equipment that use remote sensing technique. (4 marks)

ii. Identify any four critical factors to be considered in selecting a technique/application for sample analysis. (5 marks)

c. Briefly comment on the usage of the following equipment:

* Spectrometer,
* Colorimeter,
* Total Station
* Global Positioning System. (10 marks) **Total =25 marks**

2a i. What are composite variables in samples? Give two examples? 3mks

 ii. Explain the terms ‘Ph’ and ‘Electrical Conductivity;. (4marks)

b. Identify any four environmental factors that affect pH and EC measurements. (2 marks)

c. Enumerate the essential parts of a colorimeter. (6marks) **Total** =**15 Marks**

**3**a. Draw a well labelled diagram of a typical block Atomic Absorption Spectrophotometer (AAS). (8marks)

b. Briefly discuss how pH and Electrical Conductivity of a soil sample can be detected. (7 marks)

 **Total 15 marks**

4. a. Explain any two basic causes of sampling error. (8 marks)

 b. Explain the following:

1. Sampling (3 marks)
2. Population (2 marks)
3. Sample. (2 marks)  **Total = 15 marks**

5. a.Outline three reasons for sampling. (6mks)

b. Identify five variables that must be part of sample method and procedure documentation.

 (5 marks)

c. Distinguish Convenient samples and Random samples (4 marks) **Total** = **15marks**