



**JARAMOGI OGINGA ODONGA UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS FOR THE DEGREE IN SCIENCE IN  
RENEWABLE ENERGY TECHNOLOGY AND MANAGMENT**

**SECOND YEAR RESIT EXAMINATIONS 2020/21 ACADEMIC YEAR**

**CENTRE: MAIN CAMPUS**

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**COURSE CODE: SPH 3231**

**COURSE TITLE: MEASUREMENTS AND INSTRUMENTATIONS**

**EXAM VENUE: STREAM: BSc REN TECH & MGT**

**DATE: ../12/2020 EXAM SESSION:**

**DURATION: 2 HOURS**

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**Instructions**

- 1. Answer question 1 (Compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

**QUESTION ONE****(30 marks)**

- a) Briefly describe the meaning of measurement **(2 marks)**
- b) Define the term standard in measurement and instrumentation **(2 marks)**
- c) Measurement methods can be broadly classified into two broad categories, briefly explain the two categories **(4 marks)**
- d) Describe the following terms in measurement **(5 marks)**
  - I. Accuracy
  - II. Precision
  - III. Sensitivity
  - IV. Resolution
  - V. Error
- e) Differentiate between a sensor and a transducer **(2 marks)**
- f) Instrumentation is normally done for a number of reasons. In this regard, list the three (3) basic functions of instrumentation. **(3 marks)**
- g) Using a simple diagram, explain how a u-tube manometer is used to measure pressure **(8 marks)**
- h) In pressure measurement, differentiate between absolute pressure and gauge pressure **(2 marks)**
- i) Differentiate between fundamental and derived units of measurement citing examples **(2 marks)**

**QUESTION TWO****(20 marks)**

- a) Standards have been developed for other units of measurement, including fundamental units as well as for some of the derived mechanical and electrical units. In this regard, discuss the classification of standards **(8 marks)**
- b) Discuss the principle of operation of six (6) types of transducers

**(12 marks)****QUESTION THREE****(20 marks)**

- a) Differentiate between the following classes of instruments **(12 marks)**
  - I. Analogue and digital instruments
  - II. Manual and automatic instruments
  - III. Mechanical and electronic instruments
- b) The main objective of a transducer is to react only for the measurement under specified limits for which it is designed. In this regard, discuss four (4) basic requirements of a transducer **(8 marks)**

**QUESTION FOUR****(20 marks)**

- a) With regards to temperature measurement, explain the principle of operation of a thermistor and a thermocouple  
**(8 marks)**
- b) Discuss the main categories of errors in measurement and instrumentation **(12 marks)**

**QUESTION FIVE****(20 marks)**

- a) A measurement system may be defined as a systematic arrangement for the measurement. Discuss the various elements of a measurement system  
**(15 marks)**
- b) With regards to mass measurement, describe the principle of operation of an electronic load cell  
**(5 marks)**