



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND
TECHNOLOGY**
**SCHOOL OF PHYSICAL, BIOLOGICAL, MATHEMATICS AND
ACTUARIAL SCIENCES**
**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
EDUCATION (SCIENCES)**
4th YEAR SECOND SEMESTER RESIT
MAIN REGULAR

COURSE CODE: 9411

COURSE TITLE: CHEMICAL INSTRUMENTATION

EXAM VENUE:

DATE:

TIME:

EXAM

SESSION:

STREAM:

INSTRUCTIONS:

- 1. Answer question 1 (Compulsory) in section A and ANY other 2 questions in Section B.**
- 2. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A

QUESTION 1 (30 Marks)

- Using a well labeled sketch diagram, describe the overall process of an instrumental measurement (3 Marks)
- Describe the components of spectroscopic instruments in the UV/visible and IR regions. Explain in detail, the function of each component using a well labeled schematic diagram (10 Marks)
- Define the term circuit (2 marks)
- State three laws of electricity (9 marks)
- What are Data Domains (2 Marks)
 - Describe the classification of data domains (4 Marks)

SECTION B

QUESTION 2 (20 marks)

- Draw a representation of a direct series circuit and show that

$$R_s = R_1 + R_2 + \dots + R_n = \sum_{i=1}^n R_i \quad (5 \text{ marks})$$

- Often, instrument components require dc voltages that are constant regardless of the current drawn or of fluctuations in the line voltage. Draw a simple illustration of a Voltage regulator that can serve this purpose. (5 marks)
- What is the function of an oscilloscope (2 marks)
- Generally, laboratory instruments require dc power to operate amplifiers, computers, transducers, and other components.
Describe the various components of a power supply (6 marks)
- How are current, voltage, and resistance are measured in dc circuits (2 marks)

QUESTION 3 (20 marks)

- Draw a representation of a parallel series circuit and show that

$$R_p = \frac{R_1 R_2}{R_1 + R_2} \quad (5 \text{ marks})$$

- Describe the various modes of Operational amplifiers (9 marks)

c. Describe the circuit representation of an operational amplifier (6 marks)

QUESTION 4 (20 marks)

- a. Describe the components of;
 - i. a gas chromatography instrument (10 Marks)
 - ii. a high performance liquid chromatography instrument (10 Marks)

QUESTION 5 (20 marks)

- a. Discuss the applications of operational amplifiers (12 marks)
- b. Describe the components of mass spectrometry instruments. Explain in detail, the function of each component (8 Marks)