



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES**

**DEPARTMENT OF NATURAL AND APPLIED SCIENCES**

<b>QUALIFICATION : BACHELOR OF SCIENCE HONOURS</b>	
<b>QUALIFICATION CODE: 08BOSH</b>	<b>LEVEL: 8</b>
<b>COURSE CODE: ISP811S</b>	<b>COURSE NAME : INSTRUMENTATION PHYSICS</b>
<b>SESSION: JULY 2022</b>	<b>PAPER: THEORY</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

<b>SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER</b>	Prof Dipti R Sahu
<b>MODERATOR:</b>	Dr Zivayi Chiguvare

<b>INSTRUCTIONS</b>
<ol style="list-style-type: none"><li>1. Answer all questions.</li><li>2. Write clearly and neatly.</li><li>3. Number the answers clearly.</li></ol>

**PERMISSIBLE MATERIALS**  
Non-programmable Calculators

**THIS QUESTION PAPER CONSISTS OF 2 PAGES (Including this front cover)**

**Question 1** [20]

- 1.1 What are the basic control actions in process control? (5)
- 1.2 Name five different sets of test inputs that can be given to a process. (5)
- 1.3 Draw wave form of PID action and explain (10)

**Question 2** [20]

- 2.1 In the schematic DTA sequence of hydrated material having reversible and irreversible changes, explain the steps occurs first on heating? (5)
- 2.2 How is band gap calculated from UV Vis reflectance spectra? (5)
- 2.3 Explain the Beer-Lambert Law. Why are deviations from Beer's law more common in IR spectroscopy than in UV-Vis spectroscopy? (10)

**Question 3** [20]

- 3.1 What is the source of the problem in any instrument and how one can overcome it? (5)
- 3.2 What is X-ray diffraction? What types of measurement are typically made using XRD? (5)
- 3.3 How are X-ray area detector data analysed? What is involved in calibrating an XRD instrument with an area detector? (10)

**Question 4** [20]

- 4.1 Which is better the electron microscope or optical microscope? Why? (5)
- 4.2 What are Backscattered Electrons and what information can be get from BSE images? (5)
- 4.3 How does AFM work and What kind of samples can be analysed by AFM? (10)

**Question 5** [20]

- 5.1 Give example of displacement measuring Mechanical, electrical, photoelectric and optical instruments and explain its briefly? (5)
- 5.2 Which instruments measures magnetism and how? (5)
- 5.3 Why is the 4-probe method used for measurement of resistivity? Explain with diagram (10)

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