



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic Engineering

UNIVERSITY EXAMINATION FOR:

Diploma in Instrumentation and Control Engineering

2306: Industrial Measurement II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

DATE: APRIL 2024

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions; Attempt any **THREE** Questions.

Do not write on the question paper.

- Q1 a) i) Define the following as applied in chromatographic measurement:
I) Chromatography
II) Chromatogram
ii) Explain with the aid of a suitable illustration the principle of operation liquid chromatography (10 Marks)
- b) i) Explain with the aid of a diagram the working principle of the Flame Photometer detector
ii) State any **two** advantages and **two** disadvantages of gas chromatograph (10 Marks)
- Q2 a) i) State and explain Nerst's equation
ii) Explain using appropriate diagram the principle of operation Hair hydrometer.
iii) State any **two** limitations of the system in ii) (10 Marks)
- b) With the aid of sketches describe the following measurement methods of dissolved oxygen
I) Galvanic cell method
II) Polarographic method (10 Marks)
- Q3 a) i) Define "Synchro"
ii) With aid of a sketch, describe the construction and operation of a synchro system

(10 Marks)

- b) i) Distinguish between “Transolvers” and “Resolvers”
- ii) Describe with the aid of a sketch incremental optical encoder quadrature operation.
- iii) State any **TWO** industrial applications of an encoder

(10 Marks)

- Q4 a) i) Define Nuclear Magnetic Resonance (NMR) Spectroscopy
- ii) Describe with the aid of a block diagram the principle of operation of (i)
- iii) State any three applications of (i)

(10 Marks)

- b) i) Explain the working principle of the following Radiation Detector
 - I) Scintillation detector
 - II) Gas Filled Detector

(10 Marks)

- Q5 a) With the aid of block diagrams, describe the following types of optical measurement systems

- I) Fixed source-variable transmission medium system
- II) Variable source – fixed transmission medium system

(10 Marks)

- b) i) With the aid of a diagram explain the principle of operation of laser diode
- ii) State any **two** advantage and **two** disadvantages of the device in b(i)

(10 Marks)