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: JULY 2025

TIME: 2 HOURS

DATE: JULY 2025

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.

QUESTION ONE

a) i) Define the following as applied in chromatographic measurement:
   I) Chromatography
   II) Solvent
   III) Solute
   IV) Elution **(4 Marks)**

ii) State the **FOUR** steps involved in chromatographic method of separation

iii) Distinguish between the following
   I) Partition chromatography
   II) Adsorption chromatography **(6 Marks)**

b) i) Describe with the aid of sketches the following types of chromatography detectors
   I) Thermal conductivity detector (TCD)
   II) Flame ionization detector (FID) **(10 Marks)**

QUESTION TWO

a) i) With the aid of sketches describe the following measurement methods of dissolved oxygen
   I) Galvanic cell method
   II) Polarographic method **(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)**

QUESTION THREE

a) i) Define PH of a solution and state Nernst's equation

ii) Explain with simple sketches the construction of measuring electrode and reference electrode as used in PH measurement **(10 Marks)**

b) i) Draw and explain moisture measurement using resistive techniques

ii) Explain the following methods of humidity measurement

I) Dew point method

II) Psychometric method **(10 Marks)**

QUESTION FOUR

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)**

QUESTION FIVE

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)**