TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Mechanical Engineering

UNIVERSITY EXAMINATION FOR:

Diploma in plant Engineering

ECI 2330: INSTRUMENTATION SYSTEMS

END OF SEMESTER EXAMINATION

SERIES: AUG. 2024

TIME: 2 HOURS

DATE: AUG. 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 question **ONE** any **TWO** Questions.

Do not write on the question paper.

QUESTION ONE. (COMPULSORY)

(a) Explain the following terms as used in instrumentation systems

(i) Repeatability

(ii) Instrumentation System

(iii)Transducer.

(iv)Accuracy (8 marks)

(b) (i) Differentiate between the following types of instruments;

I. Null and deflection type

II. Analog and digital.

(ii) Highlight any **TWO** advantages of null type instruments as compared to deflection type instruments. (6 marks)

(c) Briefly describe the functions of the following elements in an instrumentation system.

(i) Primary sensing element
(ii) Variable conversion element
(iii) Data transmission element. (6 marks)

QUESTION TWO

(a) (i) Explain the term signal processing

(ii) State and explain any **THREE** applications of signal processing.
(iii) State any TWO techniques used in signal processing. (10 marks)

(b) Outline the steps involved in signal processing process. (7 marks)

(c) Explain the following steps involved in analog to digital signal conversion.

(i) Sampling
(ii) Quantization
(iii) Coding. (3 marks)

QUESTION THREE

(a) Explain any **FOUR** factors to consider when choosing a sensor for a particular use. (8 marks)

(b) Differentiate between negative temperature coefficient and positive temperature coefficient thermistors. (4 marks)

(c) (i) Explain the term filter.

(ii) With aid of diagrams, show the functional difference between low pass and high pass filters.
(iii) Give any **TWO** applications of filters. (8 marks)

QUESTION FOUR.

(a) (i) Explain the term multiplexing

(ii) State **FOUR** advantages of multiplexing. (6 marks)

(b) With aid of a well labelled diagram, explain how Frequency Division multiplexing takes place. (7 marks)

(c)(i) Highlight any **FOUR** advantages of the X-Y recorders.

(ii) Give **THREE** applications of X-Y recorders. (7 marks)

QUESTION FIVE

(a) (i) Explain the term 'data logging'

(ii) Using a block diagram, explain the functions of the various parts of a data logger.

(iii) State any **THREE** applications of data loggers. (14 marks)

(b) (i) Briefly describe the operation of magnetic tape recorders.

(ii) State **TWO** advantages of magnetic tape recorders. (6 marks)