TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic Engineering

UNIVERSITY EXAMINATION FOR:

Diploma in Instrumentation and Control Engineering

ECI 2304: Computer Control Systems

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.

Q1 a) i) Define the following:

I) Pilot light

II) Control station

III) Distributed control system:

IV) Transmitter

ii) In a compound control system, the ratio between variable is maintained at 3.5 to 1. If each has been converted to a 0-5V range signal, devise a signal-conditioning system that will output a zero signal to the controller when the ratio is correct.

(10 Marks)

b) Describe the general features and the working of a cascade process control system **(10 Marks)**

Q2 a) i) With the aid of a block diagram, describe a smart sensor encasing a computer-based controller with the sensor

ii) State any **THREE** areas of application of modern Computer Control.

(10 Marks)

b) A data-logging system must monitor 24 analog loops. A small computer requires per instruction and 200 instructions to address a multiplexer line and to read in and process the data in that line. The ADC performs the conversion in 60 µs. The multiplexer requires 40 µs to select and capture the value of an input line. Calculate the maximum sampling rate of particular line.

(10 Marks)

Q3 a) i) Define Supervisory Control

ii) Distinguish between Distributed Control System (DCS) and Direct Digital Control (DDC).

ii) Draw block diagrams for each of the systems in (ii)

(10 Marks)

b) i) Define **SCADA**

ii) Describe any **FIVE** major components units of the system in (i)

(10 Marks)

Q4 a) i) Figure 1.0 show a temperature control system

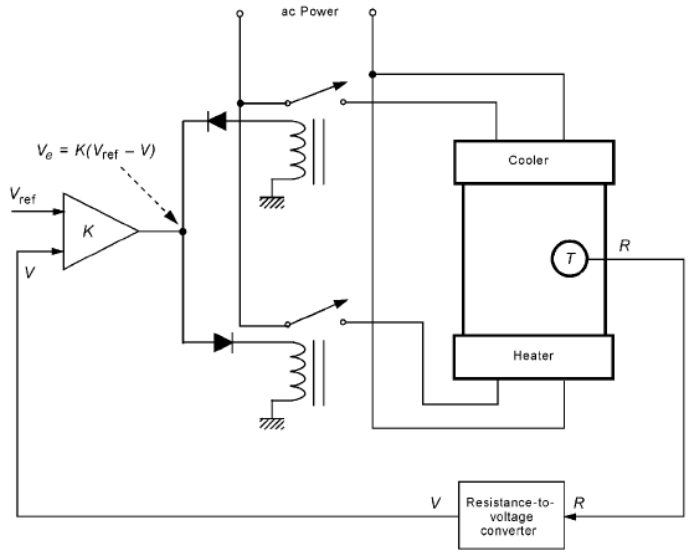

Fig. 1.0 Temperature control system

I) Explain the operation

II) Implement the process control loop using a computer

III) Describe the role of the computer. **(12 Marks)**

iii) Describe the following software formats for controllers

I) Algorithm

II) Source Code

III) Compiler

IV) High-Level Language

(8 Marks)

Q5 a) i) Draw the block diagram of a Single – board Computer (SBC) and explain the principal elements.

ii) State any **TWO** common applications of (i) **(10 Marks)**

b) i) Define "Data Logger"

ii) With the aid of a block diagram, describe a multi-loop control scheme employing multiplexers, demultiplexers and a centralized computer to read multiple input values from measuring devices and provide control function.

(10 Marks)