



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical & Electronics engineering

UNIVERSITY EXAMINATION FOR:

BACHELOR OF ELECTRICAL AND ELECTRONIC ENGINEERING

TEE 4414: PLC AND SCADA SYSTEMS

END OF SEMESTER EXAMINATION

ORDINARY PAPER

SERIES AUGUST 2024

TIME:2HOURS

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 (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

a) Explain the functions of:

(i) CPU

(ii) Input/output (I/O) Interface.

[10 marks]

b) Outline the steps in selecting a PLC for a particular application.

[10 marks]

Question Two



TUM is ISO 9001:2015 Certified

- a) Design a motor control circuit of a three-speed motor, which is used to drive a cooling fan by developing state diagram and Boolean expression. **[10 marks]**
- b) Design a circuit for a forward-reverse motor operation. **[10 marks]**

Question Three

- a) Design a PLC system that enables the control of the sequential starting of three conveyors according to the following operating mode B.
- (i) The conveyors will be switched on separately, whereas pressing a button will switch all the conveyors off at the same time. Switch the conveyors on according to the sequence: conveyor 3, conveyor 2, conveyor 1, after switching the system on through the button S_4 to prevent overload conditions.

Further more pressing the emergency button S_0 will always switch off the system.

Thermal protections of the conveyors (Q_1 , Q_2 , Q_3) are connected in series with each other, so that the overload applied to one of the conveyors is sufficient to stop the whole system.

The LED H_4 signals the ON/OFF state of the system. The LEDs H_1 , H_2 , H_3 signal the operating condition of each conveyor.

- (ii) Besides what is specified in the first mode, a conveyor can be switched off separately if one of these devices is in overload. The buttons to be pressed in this case are S_6 , S_7 and S_8 respectively concerning the 1st, second and third conveyor.

[10 marks]

- b) Design a PLC system that handles the control of a feeder according to the following modes.
- (i) Pressing the button S_1 will connect a group of capacitors at a time, whereas pressing the button S_2 will disconnect it. Thus, pressing the button S_1 for four consecutive times will enable the four counters in sequence; on the contrary pressing the button S_2 for four times will disconnect these counters (in sequence).



- (ii) Besides the first operating mode, carry out the control of five lines, instead of four.

[10 marks]

Question Four

- a) Outline the various main control units in a typical SCADA system. [10 marks]
- b) Explain the functions of various network services in a SCADA system. [10 marks]

Question Five

- a) (i) State any **FIVE** uses interface feature in SCADA operating system.
(ii) Outline the process of alarm even processing. [10 marks]
- b) Enumerate hardware and software maintenance works in a SCADA system. [10 marks]

