# MURANG'A UNIVERSITY OF TECHNOLOGY

## SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2021/2022 ACADEMIC YEAR

**THIRD** YEAR **FIRST** SEMESTER EXAMINATION FOR, DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

**EEE 071: INDUSTRIAL PROGRAMMABLE LOGIC CONTROLLER**

DURATION:2 HOURS

**Instructions to candidates:**

1. Answer question One and Any Other Two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

**SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION**
**QUESTION ONE (30 MARKS)**

a) State the meaning of the following instruction sets and sketch their ladder diagram symbols.
   i)     TMR
   ii)    R
   iii)   NC
   iv)    CNT
   v)     I                                                                      (5marks)

b) Explain five functions of Remote Terminal units (RTUs) in the Supervisory Control System.
                                                                                 (3 marks)

c) With the sketch, explain the following term related to telemetry.             (3 marks)

d) With the aid of ladder diagram, explain the control of direct-on-line (DOL) Forward Reversed Motor Control System.                                                    (5 marks)

e) Explain the term 'expert system' and state two of its application in SCADA systems. (5marks)

f) State any three applications of PLCs and SCADA combination.                    (3 marks)

**SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION**
**QUESTION TWO (20 MARKS)**

2. a) Outline four advantages of using wide area network (WAN) system.            (4 marks)
b) State any four differences between OSI and TCP protocol.                        (4 marks)
c) With a diagram explain construction of the following topologies.
i) Bus topology

ii) Tree topology                                                                 (6marks)

d) With labelled block diagram, explain the operation of TCP/IP model.            (6 marks)

**QUESTION THREE (20 MARKS)**

3. a) State any four mode of communication in SCADA system.                    (4 marks)

b) Describe the following terms as related to SCADA architecture.

   i.    Hardware
  ii.    Software

                                                                     (6 marks)

c) Explain the functioning of Human machine interface (HMI) in the system.    (2 marks)

d) Explain the four working procedure for SCADA system.                    (8 marks)

**QUESTION FOUR (20 MARKS)**

4. a) State three advantages of sequential functions chart PLCs language.    (3 marks)
b) Explain two types of PLC.    (4 marks)
c) Describe how to write ladder diagram language in PLC system.    (4 marks)
d) Using well labelled diagram, explain the operation of PLC Architecture.    (9 marks)