MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND TERM EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

PLC

DATE: 8/6/2021 **TIME: 8.30-11.30 AM**

INSTRUCTIONS

ATTEMPT ALL QUESTIONS

1. a) State three merits of ladder programming language applied in PLCs. (3 marks)

   b) A car ignition system has the following condition. When the car door (D) is open and the seat belt (S) is not done up, the ignition power (I) must not be applied. If all is safe then the key (K) will start the engine.

      i. Develop ladder logic diagram system

      ii. Write the equivalent instruction list program (8 marks)

   c) Draw a labeled block diagram of a PLC and explain the function of each block (9 marks)

2 a) State five advantages of using a PLC over relay-based systems in industrial processes. (5 marks)

   b) A vault security door (V) has three keys each under the custody of different three people A,B and C. The door can be open only if person A and either person B or C are present.

      i. Draw a truth table for the system such that A is the least significant bit and C is the most significant bit.

      ii. Derive the system ladder diagram from the truth table

      iii. Write the equivalent instruction list program. (15 marks)

3. a) Describe four PLC programming devices. (8 marks)

b) Describe three types of counters used in a PLC system. (6 marks)

c) A certain memory stores 2048 words. Each word is 16 bits wide. Determine;

i. Number of address lines

ii. Capacity in kilobytes

iii. Word size in bytes (6 marks)

4. a) With an aid of a labeled diagram explain the working principle of optoisolator/ optocoupler in PLC interfacing. (8 marks)

b) With the aid of waveform diagrams describe each of the following types of timers;

i. Timer-ON

ii. Timer-OFF (6 marks)

c) Describe each of following PLC functions;

i. Internal relays or markers

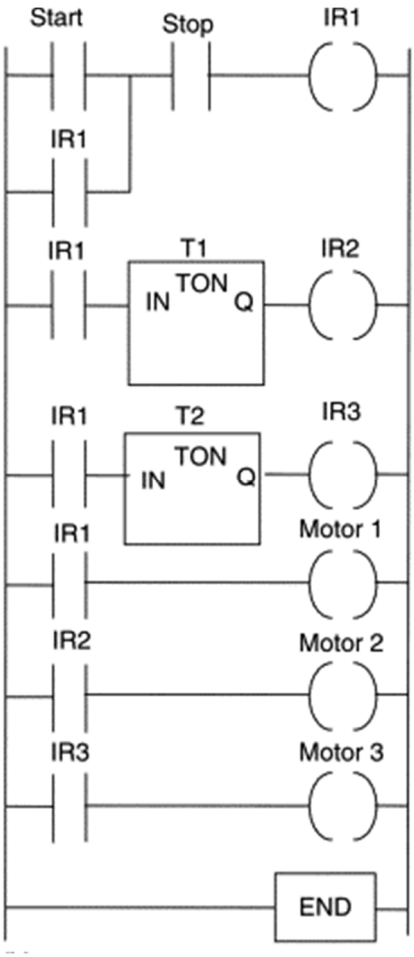
ii. Interlocking. (6 marks)

5. a) Describe four PLC programming languages. (8 marks)

b) Figure below shows a ladder diagram for motors in an industrial setup. Assuming that timer 1 has a preset time of 30 seconds and timer 2 has a preset time of 60 seconds

i. Explain the operation of the system

ii. Write the equivalent instruction list program. (12 marks)


Start
Stop
IR1
IR1
IR1
T1
TON
IN
Q
IR2
IR1
T2
TON
IN
Q
IR3
Motor 1
IR1
IR2
Motor 2
IR3
Motor 3
END

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