TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING (DME)

EEP 2350: PROGRAMMABLE LOGIC CONTROLLERS

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: FEBRUARY 2015
TIME: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
        - *Answer Booklet*
This paper consists of **FIVE** questions. Attempt any **THREE** questions
Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (Compulsory)

a) (i) What information is stored in the input image table file of a PLC **(2 marks)**

   (ii) In what form is this information in (i) above stored **(4 marks)**

b) (i) Outline the sequence of events involved in a PLC scan cycle **(10 marks)**

   (ii) Difference between open and proprietary PLC architecture **(4 marks)**

Question Two

a) State the FOUR types of system buses in PLC and explain how they are used **(8 marks)**

b) With aid of a block diagram, explain the major components of a PLC **(12 marks)**

Question Three

a) Design a ladder logic diagram for starting a star-delta motor starter. Name all the inputs and output devices **(8 marks)**

b) Derive the transfer function for the system below showing each step followed:

   Y(s)

$$G_1 = \frac{3}{5}, \ G_2 = 2'S, \ G_3 = 4, \ G_4 = \frac{1}{5}$$
$$H_1 = 5 \ and \ H_2 = 0.5$$

   where **(12 marks)**

Question Four

a) Describe a human machine interface as used in computer-based control system **(4 marks)**

b) How does a processor identify the location of a specific input or output device **(2 marks)**

c) What is meant by a logic rack in PLCs **(2 marks)**

d) Draw a ladder logic diagram in the table below:

Address	Intrusion	Data
0001	LD	I1.1
0002	O	Q0..0
0003	AN	I0.0
0004	OUT	Q0.0
0005	LD	I0.0
0006	AN	I0.1
0007	OUT	Q0.2
0008	LD	I0.1
0009	AN	T37
0010	OUT	Q0.4
0011	LD	I0.1
0012	TON	T37#100
0013	LD	T37
0014	OUT	Q0.1
0015	END	

(12 marks)

Question Five

a) (I) Draw the electrical symbol used in PLC to represent each of the following control devices:
  (i) Solenoid
  (ii) Relay
  (iii) Motor overload relay contact
  (iv) Push button switches **(8 marks)**

  (II) Explain what is meant by the terms: **(4 marks)**

  (i) Current sinking
  (ii) Current sourcing **(4 marks)**

b) Compare discrete and analog 1/0 modules with respect to the type of input or/and output devices with which they can be used **(8 marks)**