



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

EEP2350: PROGRAMMABLE LOGIC CONTROLLERS

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: SEPTEMBER 2018

TIME: 2HOURS

DATE: Pick Date Sep 2018

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.

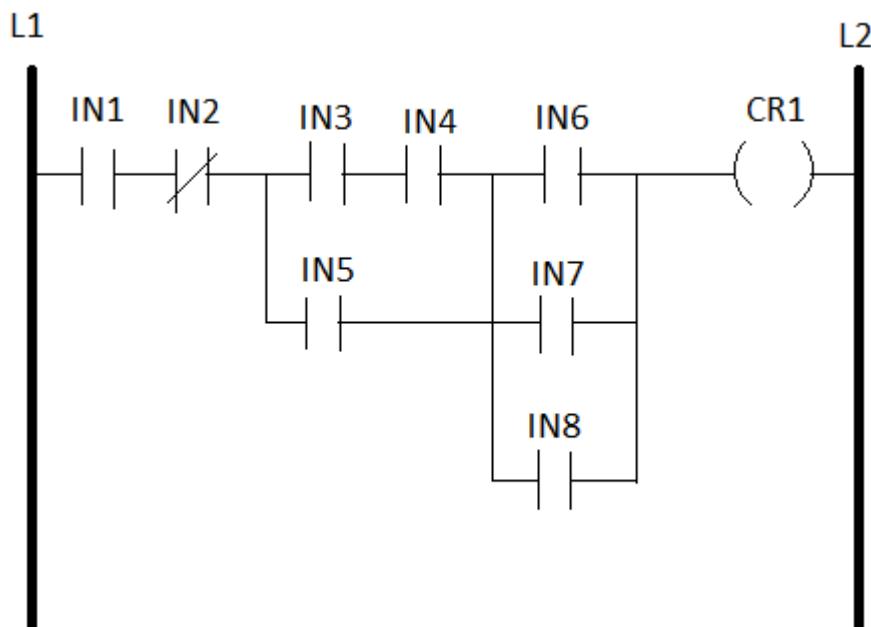
Do not write on the question paper.

Question ONE (COMPULSORY)

- a) Explain the main function of each of the following major components of a PLC:
- i). Processor module (CPU)
 - ii). I/O modules
 - iii). Programming device
 - iv). Power supply module** (12 marks)
- b) Compare the single-ended, multitask, and control management types of PLC applications. (9 marks)
- c) What two categories of software written and run on PCs are used in conjunction with PLCs? (4 marks)
- d) List five factors affecting the memory size needed for a particular PLC installation. (5 marks)

Question TWO

- a) Enumerate the conventions that are adopted in drawing a ladder diagram (7 marks)
- b) Draw a ladder diagram of the following mnemonic code (6 marks)
- | | | |
|------|----------|------|
| 0000 | LOAD NOT | IN1 |
| 0001 | OR NOT | IN2 |
| 0002 | OR | IN3 |
| 0003 | AND | IN4 |
| 0004 | OUT | CR1 |
| 0005 | OUT | CR2 |
| 0006 | AND | RLY1 |
| 0007 | OUT | CR3 |
- c) Write down an instruction listing for the circuit in figure Q4. (8 marks)



Question THREE

- a) Explain the terms *program* and *programming language* as they apply to a PLC. **(4 marks)**
- b) Express each of the following equations as a ladder logic program:
- $Y = (A + B)CD$
 - $Y = A\bar{B}C + \bar{D} + E$
 - $Y = [(\bar{A} + \bar{B})C] + DE$
 - $Y = (\bar{A}BC) + (D\bar{E}F)$
- (16 marks)**

Question FOUR

- a) Explain the following terms as applied in control systems
- Controlled variable
 - Controlled medium
- (2 marks)**
- b) Using block diagrams, explain the difference between open and closed loop control system
(8marks)
- c) Derive the transfer function for the system in figure Q4.
(10 marks)

Question FIVE

(a) describe the function of the following timers using timing diagrams.

- ON delay timer
 - OFF delay timer .
- (6 marks)**

(b) With the aid of diagrams explain the following terms

- current sinking
 - current sourcing
- (6 marks)**

(c) (i) Write a ladder logic program for the relay ladder diagram shown in fig Q5.

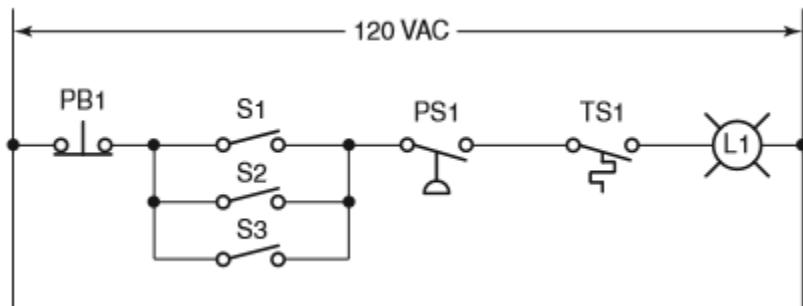


Fig. Q5 **(5 marks)**

(ii) draw a gate circuit for the program in (i) above. **(3 marks)**

