



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

Qualification Code : 071606T4MCT
Qualification : Mechatronic Technician Level 6
Unit Code : ENG/OS/MC/CR/05/6/A
Unit of Competency : Carry out mechatronic programming

WRITTEN ASSESMENT

INSTRUCTIONS TO CANDIDATE:

1. You have **THREE HOURS** to attempt all the questions.
2. Marks for each section are indicated in the brackets
3. The paper consists of **TWO** sections: **A** and **B**.
4. Attempt **ALL** questions from section **A** and **ANY THREE** questions from section **B**.
5. You are required to provide your responses on the answer booklet provided.

SECTION A: SHORT ANSWER QUESTIONS (40 MARKS)

1. List the **five** standard PLC languages as defined by the International Standard for Programmable Controllers. (5 marks)
2. Identify **four** possible causes of a complete stoppage of the control operation and the PLC with the power-on lamp off. (4 marks)
3. State the **two** general sensing classifications for analog input modules. (2 marks)
4. A motor is switched on by pressing a spring-return push-button start switch, and the motor remains on until another spring-return push-button stop switch is pressed.
Draw the ladder rungs to perform the operation. (4 marks)
5. Name the tag type used for each of the following: (3 marks)
 - i. Create an alternate name for a tag.
 - ii. Share information over a network.
 - iii. Store various types of data.
6. List the **three** major components of CPU of a PLC. (3 marks)
7. Identify **four** types of timers used in PLC. (4 marks)
8. Explain why a stop button must be normally closed and a start button must be normally open. (4 marks)
9. Describe **two** ways of replacing a defective PLC card. (4 marks)
10. Name **two** uses of the indicator lights on a PLC. (2 marks)
11. Given a clear plastic bottle, list **three** different types of sensors that could be used to detect it. (3 marks)
12. Identify the difference between wiring a sourcing and sinking output. (2 marks)

SECTION B: EXTENDED ANSWER QUESTIONS (60 MARKS)

13. Given that for the circuit shown in the **Error! Reference source not found.** below,

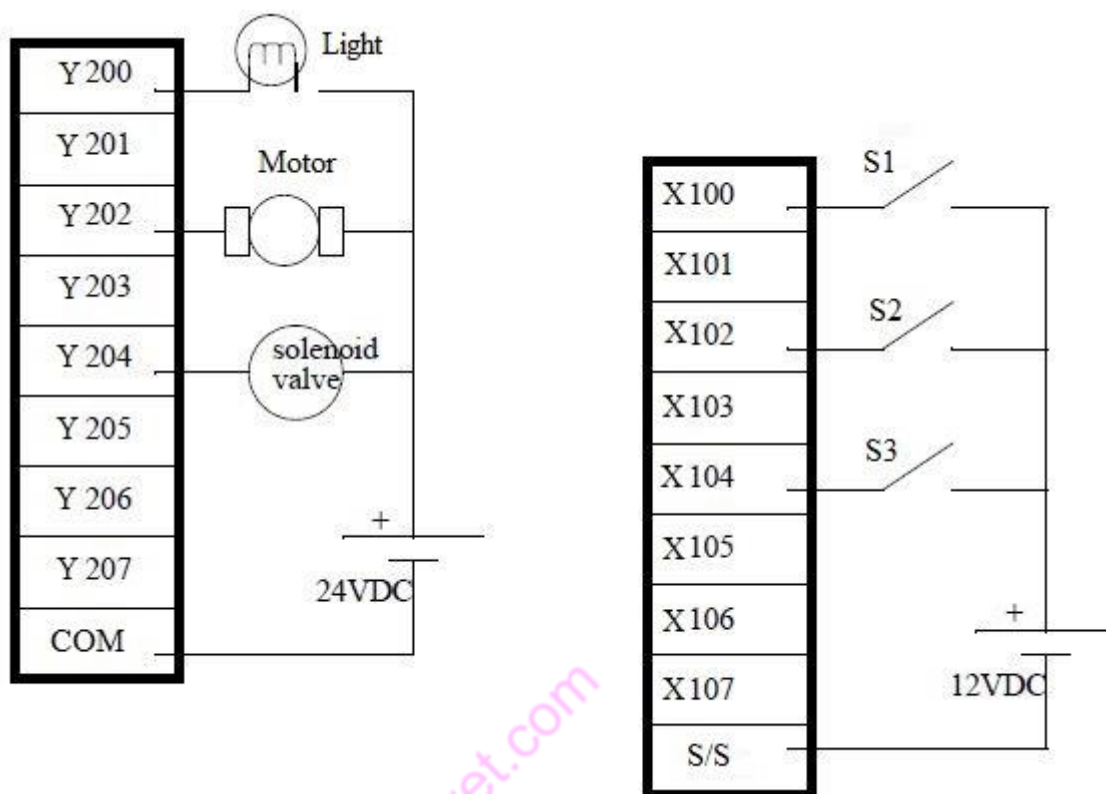


Figure 1

Switch S1 controls the light, switch S2 the motor, and S3 the solenoid valve;

- i. List the input and output addresses for the PLC. (6 marks)
- ii. Write a simple ladder logic program having the following additional information; (14 marks)
 - A stop switch S4 is connected to input X106 – it switches off everything.
 - The motor runs after pressing S2 twice.
 - Solenoid valve energize for 30 seconds (time base of 0.1s)

14. A PLC model has a number of different CPU units that can be ordered. One model has 10 I/O terminals of 6 DC outputs and 4 outputs and can be ordered for use with either AC or DC power supplies. The outputs can be selected as either relay output or transistor output with two forms of transistor output available –namely, sink or source type. Explain the capability of such a PLC and the significance of the various forms of output. (20 marks)

15. Although the PLC can't talk, it can communicate in various ways to show what the problem is. There are status lights on the processor, power supply, and I/O rack that indicate proper operation, as well as status lights that alert the trouble-shooter to the problem. Elaborate on **six** indications of the status lights of a typical processor with built-in power supply. Give a possible **solution(s)** in each case. (20 marks)
- 16.
- i. Discuss **five** distinct advantages that PLCs offer over conventional relay-based control systems. (10 marks)
 - ii. Demonstrate your understanding of functions of **five** major components of a PLC (10 marks)

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