INTI International College Penang

FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**August 2020**
Programme	:	Diploma in Electrical & Electronic Engineering (DEEI)
Course	:	**EGE1101: Introduction to Programmable Logic Controller**
Date of Examination	:	18 December 2020 (Friday)
Time	:	2.00pm – 5.00pm Reading Time : Nil
Duration	:	3 Hours

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer **ALL** questions. All questions carry equal marks.

Material permitted :
Non-Programmable Scientific Calculator

Materials provided :
Nil

Examiner(s)	:	**Steven Khoo Boo Tap**
Chief Moderator	:	Richard Lai Tian Fat

*This paper consists of **6** printed pages, including the cover page*

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)
EGE1101: INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLER
FINAL ALTERNATIVE ASSESSMENT: AUGUST 2020 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer **ALL** questions. All questions carry equal marks.

Question 1

(a) All PLCs contain different amounts of RAM and ROM depending on the design of the PLC manufacturer. The use of a PLC's memory is determined by the design unit.

(i) Present with explanation why the executive memory is considered as part of the PLC's operating system.

(3 marks)

(ii) Present with explanation why data memory is required in a PLC.

(3 marks)

(b) The central processing unit (CPU) is built into single-unit fixed PLCs while modular type PLC use a plug-in module. Illustrate the PLC processor module using an appropriate block diagram. The block diagram should also include other related modules. Also, explain those sections inside the processor module.

(7 marks)

(c) Explain the scan time of PLC using appropriate diagram with proper labelling.

(6 marks)

(d) Find **ONE** answer and explain the reason for that answer.

(i) Basically, the main function of a PLC is to:
A. amplify various weak signal sources.
B. make logical decisions and control outputs based on them.
C. control the speed of motors.
D. control a high voltage output with a low voltage input.

(3 marks)

(ii) The main difference between a PLC and relay control system is that:
A. different types of input and output devices are used.
B. different types of data communications are used.
C. different input and output voltage levels are used.
D. one uses hardwired relay control logic and the other uses programmed instructions.

(3 marks)

Question 2

(a) The methods used by user to communicate information with PLC is known as PLC programming language. Illustrate the types of languages associated with the PLC programming with the aid of a diagram and description. Explain why ladder logic diagram is the most commonly used in PLC language.

(8 marks)

(b) Using KV-N14DT Keyence PLC, produce a KV-script programming for ladder logic diagram shown in Figure 2(b).

Figure 2(b)

(5 marks)

(c) By referring to the ladder logic diagram shown in Figure 2(c) and answer the following questions:

(i) Discover under what condition(s), output R300 will be true.

(3 marks)

(ii) Discover under what condition(s), output R302 will be false.

(3 marks)

(iii) Discover under what condition(s), output R304 will be true.

(3 marks)

(iv) Discover under what condition(s), output R306 will be false.

(3 marks)

The ladder logic diagram in Figure 2(c) is treated as one diagram.

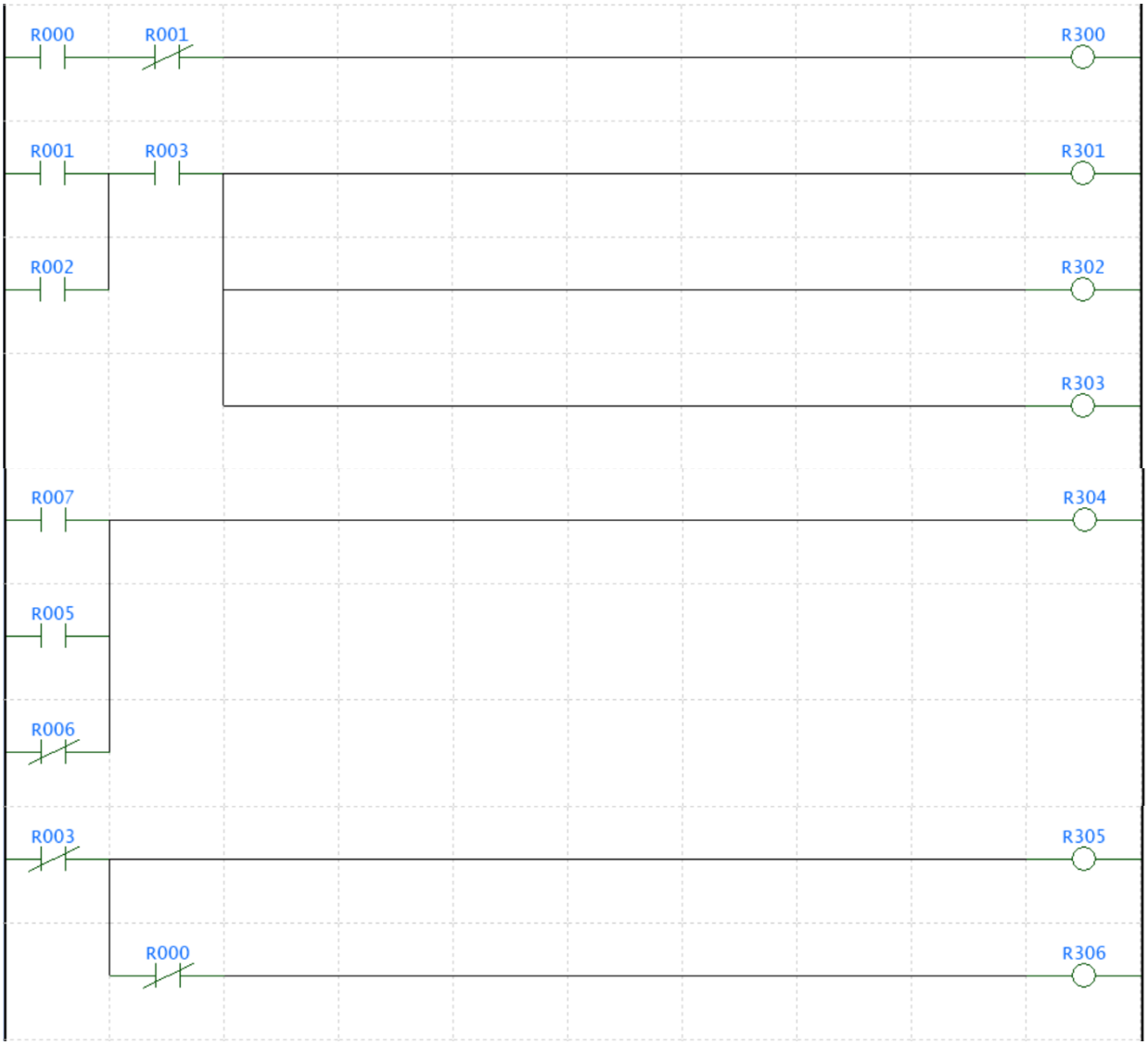

Figure 2(c)

Question 3

(a) Present the on-delay timer comparison table as shown in Table 3(a) that should cover the following:

(i) On-delay timer with normally open, timed-closed (NOTC) contact.

(2 marks)

(ii) On-delay timer with normally closed, timed-open (NCTO) contact.

(2 marks)

(iii) Using appropriate relay schematic circuits and timing diagrams to illustrate the difference between NOTC and NCTO contacts.

(4 marks)

Table 3(a)

On-Delay Timer Comparison	
NOTC: Symbol	NCTO: Symbol
NOTC: Explanation	NCTO: Explanation

(b) Given the following mnemonics list of a PLC as shown in Table 3(b). Change the mnemonics list to ladder logic diagram and explain the function of the program.

Table 3(b)

Mnemonics	
LD	R002
AND	MR100
OUT	R502
LD	MR100
C	#1 #2 R002
LD	C1
OUT	R503

(5 marks)

(c) Justify how the processor handles the arrangement of series instructions of a rung programmed for a given ladder logic diagram. Use an appropriate diagram to aid your explanation.

(6 marks)

(d) An equivalent logic gate circuit of PLC control system is shown in Figure 3(d). Construct the ladder logic diagram and the relay schematic for the PLC control system shown in Figure 3(d). The inputs A and B are represented by Pushbuttons and output Z is represented by Pilot Light.

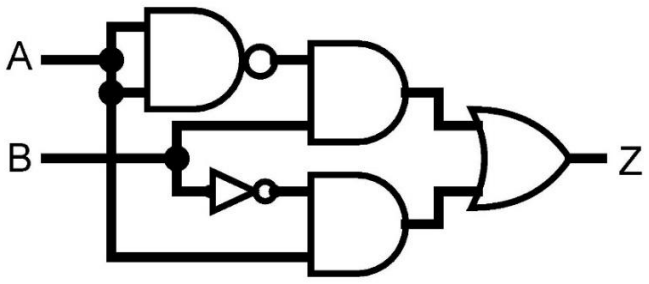

Figure 3(d)

(6 marks)

Question 4

(a) Illustrate with the aid of diagram for the following:

(i) A typical input for a current sinking input module.

(3 marks)

(ii) A typical output for a current sourcing output module.

(3 marks)

(b) Illustrate and explain the following photoelectric sensors used to interface with PLC:

(i) Through-Beam Sensors.

(2 marks)

(ii) Retro-Reflective Sensors.

(3 marks)

(iii) Diffuse-Reflective Sensors.

(2 marks)

(c) A control system that uses two start buttons and two stop buttons to control a motor. When either start button is depressed, the motor runs. By use of a seal-in contact, it continues to run when the start button is released. Either stop button stops the motor when it is depressed. Produce the ladder logic diagram of the control system and its equivalent logic gate circuit. Use label A, B, C and D for start and stop buttons and M for motor in the equivalent logic gate circuit.

(8 marks)

(d) Construct an equivalent logic gate circuit for the ladder logic diagram shown in Figure 4(d).

Figure 4(d)

(4 marks)

~THE END~