



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JULY 2010 SESSION

SUBJECT CODE : FAD 20402
SUBJECT TITLE : PROGRAMMABLE LOGIC CONTROLLER 1
LEVEL : DIPLOMA
TIME / DURATION : 9.00 am – 11.00 am
(2 HOURS)
DATE : 14 NOVEMBER 2010

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper **CAREFULLY**.
 2. This question paper is printed on both sides of the paper.
 3. Please write your answers on the answer booklet provided.
 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 5. This question paper consists of **TWO (2)** sections. Section A & B. Answer all questions in Section A. For Section B, answer **TWO (2)** question only.
 6. Answer all questions in English.
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THERE ARE 10 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)**INSTRUCTION: Answer ALL questions.****Please answers all in answer booklet provided.****Question 1**

(a) Define programmable logic controller.

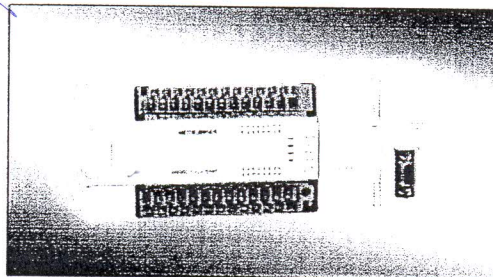
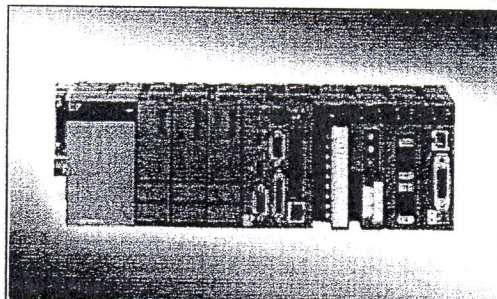
(2 marks)

(b) State two common types of PLC programming device.

(2 marks)

Question 2Define **HMI** and give three examples.

(4 marks)

Question 3Answer all questions by referring to the **Figure 1(a)** and **Figure 1(b)**:**Figure 1(a): Type A of PLC****Figure 1(b): Type B of PLC**

- (a) Determine two different categories of PLC in **Figure 1(a)** and **Figure 1(b)**. (2 marks)
- (b) Give two advantages of using PLC in **Figure 1(b)** rather than using PLC in **Figure 1(a)**. (2 marks)

Question 4

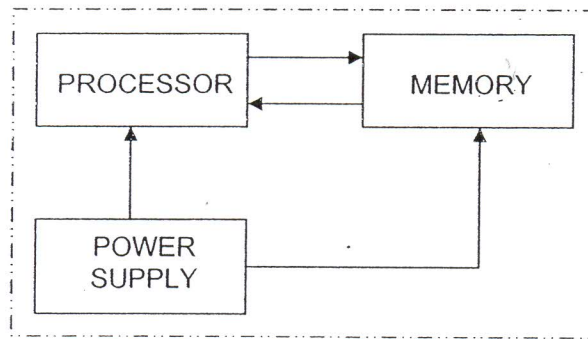


Figure 2: Major components of the CPU

The CPU houses the processor-memory module(s), communications circuitry and power supply. Explain the basic function of each of the three major parts of CPU.

(6 marks)

Question 5

Compare **ROM** and **RAM** memory design with regard to:

(6 marks)

- (a) Information is placed into memory
- (b) Information in the memory is changed
- (c) Classification as volatile or nonvolatile

Question 6

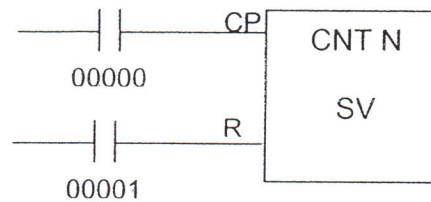
Describe 2 types of DC input mode.

(4 marks)

Question 7

Programmable controller, which processes the data received according to a written program. State five programming languages that internationally recognized.

(5 marks)

Question 8**Figure 2:** Counter symbol

(a) From **Figure 2**, give the definition of the followings.

(4 marks)

- i. CNT N
- ii. SV
- iii. CP
- iv. R

(b) Please describe the execution condition when 00000 is ON based on **Figure 2**.

(3 marks)

(c) Please describe the execution condition when 00001 is ON based on **Figure 2**.

(3 marks)

Question 9

Answer all questions based on **Figure 3**:

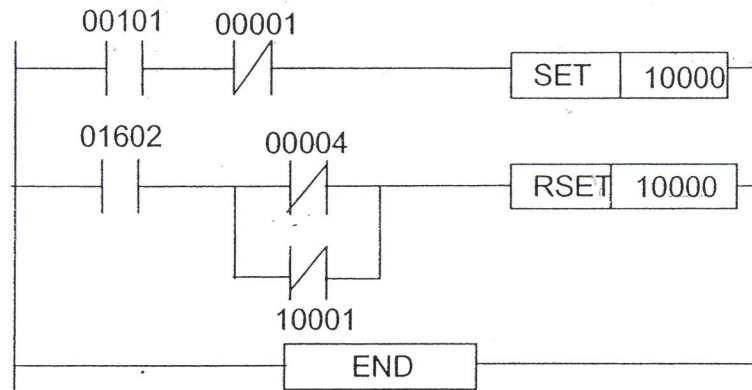


Figure 3: Ladder diagram with SET/RESET

- (a) Redraw the ladder diagram in **Figure 3** by replace the latching circuit (SET/RSET) to self-holding contact. (3 marks)

- (b) Explain the function of SET/RSET. (2 marks)

Question 10

Draw the ladder diagram by referring the **Table 1**.

(12 marks)

Table 1: Instruction list

STEP	INSTRUCTIONS	PLC ADDRESS
00000	LD	00000
00001	SET	01600
00002	LD NOT	00001
00003	OR NOT	00002
00004	RST	01600
00005	LD	01600
00006	OUT	TR0
00007	AND NOT	TIM 000
00008	OUT	10000
00009	LD	TR 0
00010	AND	00003
00011	LD	00004
00012	OR	10001
00013	AND LD	-
00014	OUT	10001
00015	LD	00004
00016	DIFU(13)	01601
00017	LD	01601
00018	AND	01600
00019	OUT	10003
00020	LD	00005
00021	AND NOT	01600
00022	LD NOT	00006
00023	AND	00007
00024	OR LD	-
00025	TIM	000
		#100
00026	END	-

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.

Please answers all in answer booklet provided.

Question 11

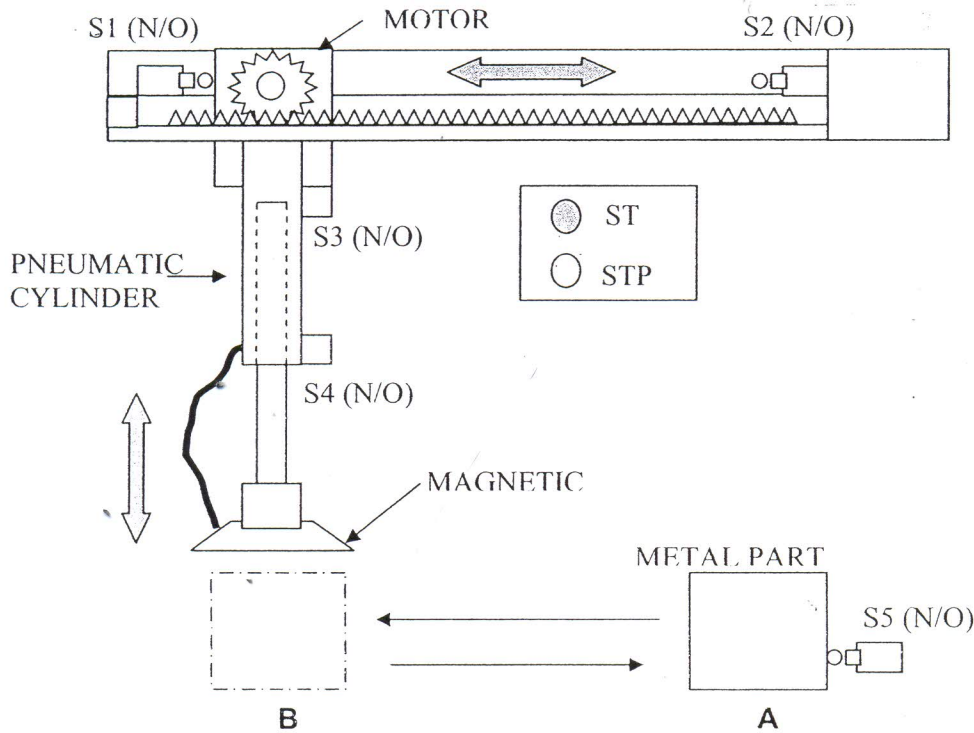


Figure 4: Lifter System

Description of the system:

When ST push button is pressed and released, the following will be executed:

- The lifter arrived at S2; the double acting cylinder will extend until S4.
- If metal part is detected by S5, then the magnetic plate will be ON and the cylinder remain extend for 5 seconds as to pick up metal part.
- After 5 seconds, the cylinder will retract until S3 and the lifter will move to right until S1.

- The cylinder will extend until S4 and remain extended for 5 seconds. During that, the magnetic plate will be OFF as to release the metal part.
- Finally, after 5 seconds, the cylinder will retract and remain at initial position. STP push button is used when to stop the lifter system at any position.

Answer all the questions below based on **Figure 4**.

- (a) List the PLC input and output devices. (4 marks)
- (b) Draw the PLC input and output schematic diagram based on PLC CQM1-H CPU21. (4 marks)
- (c) Design the ladder diagram and you must follow these sequence of operation:
- i. Start and Stop for standby mode. (2 marks)
 - ii. The lifter arrived at S2 from initial position at S1. (2 marks)
 - iii. The lifter picks up the metal part. (4 marks)
 - iv. Transfer the metal part for position A to position B. (4 marks)

Question 12

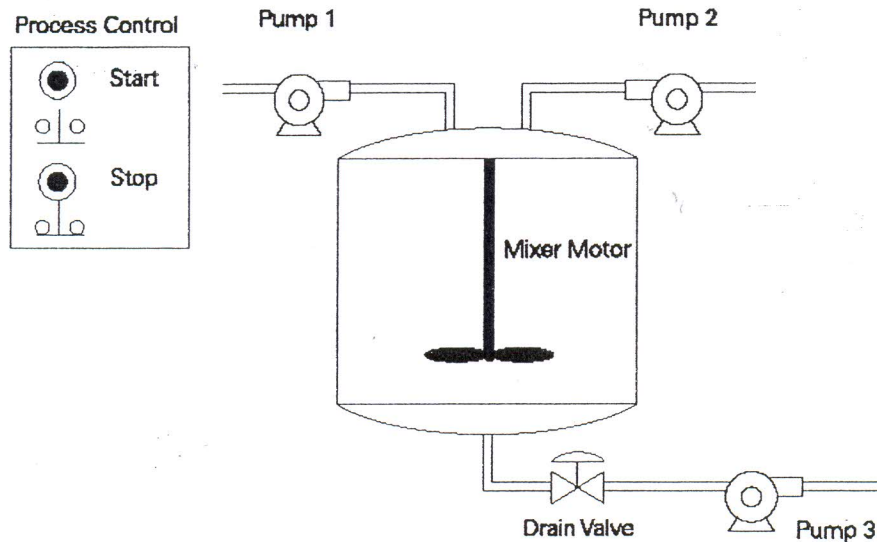


Figure 5: Fill and Drain System

Description of the system:

A tank will be filled with two chemicals, mixed, and then drained. When the Start Button (00000) is pressed, pump 1 will ON controlled by output 10000. Pump 1 runs for 5 seconds, filling the tank with the first chemical, then shuts off. The program then starts pump 2, controlled by output 10001 Pump 2 runs for 3 seconds filling the tank with the second chemical. After 3 seconds, the pump 2 stops. The program starts the mixer motor, connected to output 10002 and mixes the two chemicals for 60 seconds. The program then opens the drain valve controlled by output 10003, and starts pump 3 controlled by output 10004. Pump 3 shuts off after 8 seconds and the process stops. A manual Stop switch is also provided. Pump 1, Pump 2, Pump 3, and Mixer motor are using single phase 240 AC Motor.

Answer all questions below referring **Figure 5**:

- (a) List the PLC input and output devices. (3 marks)
- (b) Draw the PLC input and output schematic diagram based on PLCCQM1-H CPU21. (3 marks)
- (c) Design the ladder diagram for Fill and Drain system based on the following sequence.
- i. Start and Stop process (2 marks)
 - ii. Pump_1 control (3 marks)
 - iii. Pump_2 control (3 marks)
 - iv. Mixer control (3 marks)
 - v. Drain valve control and Pump_3 control (3 marks)

Question 13

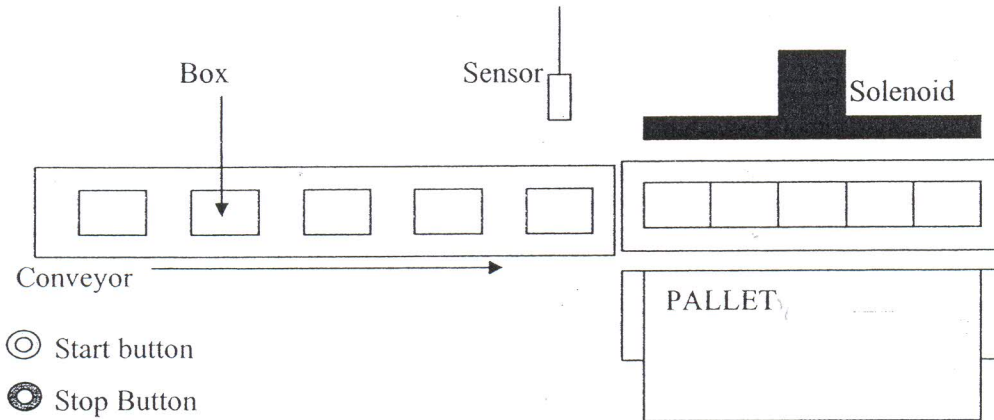


Figure 6: Top view of Conveyor system

Operation:

The control circuit is used to detect and count the number of products being carried on an assembly line. To operate and stop the system, we have to press the start and stop button. The conveyor will move upon the system ON. When a sensor (**N/C**) detects the products, it will counts until **10**, after that the solenoid will extend and put all the products into the pallet. The solenoid is energized for a period of **5** seconds and is then shut off, causing it to retract. Answer all question based on **Figure 6**:

- Design the ladder diagram of the Conveyor system. Your ladder diagram should consist of MCR and your Holding Contact should be using **Self holding** contact. (8 marks)
- Convert the ladder diagram in Q11 (a) to Instruction List (IL). (6 marks)
- Modify the self holding contact by using function **SET/RESET** so that when we release the start button the system still ON. Redraw the ladder diagram with the necessary modification. (6 marks)

END OF QUESTION