UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BMT 2063 / BET 2063
COURSE	: PROGRAMMABLE LOGIC CONTROLLER
SEMESTER/SESSION	: 2 – 2023/2024
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **4** questions. Answer all questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 7 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) PLC unit can be chosen either in compact or modular. Give five (5) characteristics of a compact PLC.

(5 marks)

b) The central processing unit (CPU) of a PLC control all the PLC activities and does a repetitive process known as scanning. Give the three processes that occurs during scanning. (3 marks)

c) Give the reason of having an optical isolator circuit inside the PLC input terminal.

(3 marks)

d) Describe the characteristics for each of the following type of digital output module:

i. Triac based digital output (3 marks)
ii. Relay based digital output (3 marks)
iii. Transistor based digital output (3 marks)

e) You are given one normally open pushbutton, one normally closed limit switch, one lamp and one solenoid valve. Outline the wiring diagram of all these components to a CPM2A PLC unit. (5 marks)

QUESTION 2

a) Give in the correct order the five (5) systematic approaches when programming a PLC.

(5 marks)

b) Describe the meaning of latching instruction. Provide your answer with an example of a latching ladder diagram.

(3 marks)

c) Describe how does the instruction of SET and RSET operates.

(4 marks)

d) Produce the ladder diagram program using SET/RSET instruction for the following operation:

- By pressing Start pushbutton, an indicator lamp L1 will turn on.
- After lamp L1 has turned on and by pressing Run pushbutton, another indicator lamp L2 will turn on together with extension of cylinder using single solenoid valve.
- When the cylinder has fully extended, the cylinder then retracts.
- After cylinder has retracted and by pressing Reset pushbutton, all indicator lamps L1 and L2 will turn off.

Note: The cylinder is equipped with limit switches (LS1 and LS2).

(13 marks)

QUESTION 3

a) Describe three (3) advantages of using timer instruction in PLC system.
(6 marks)

b) Briefly explain the operation of timer instruction in Omron PLC.
(4 marks)

c) Refer to the ladder diagram program in Figure 1.
   i. Find the length of the timer. (1 mark)
   ii. Describe the status of each output when the ladder diagram is operated.
(2 marks)

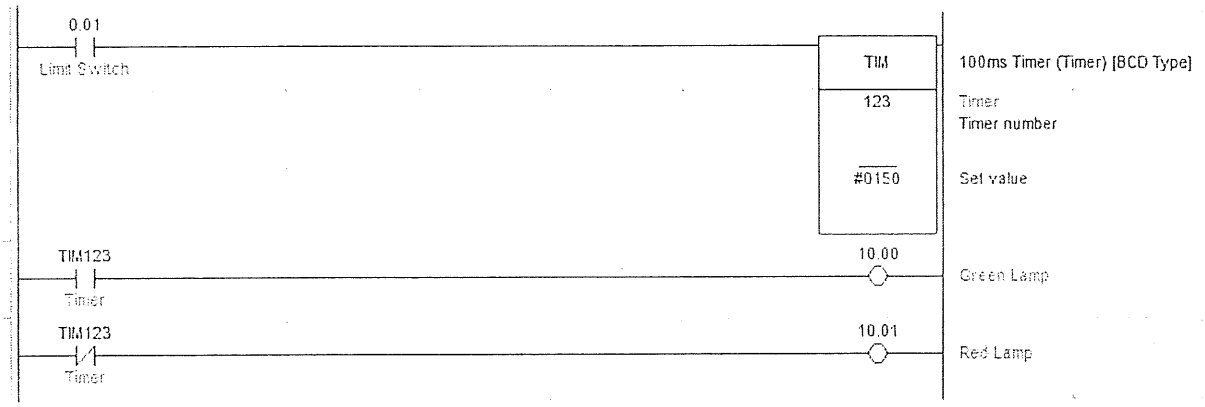

Figure 1

d) Figure 2 a silo plant equipped with two conveyors running using two motors separately. By pressing pushbutton Start, a Run indicator lamp will turn on and after 5 seconds, conveyor belt 1 operates. Then after another delay of 5 seconds, conveyor belt 2 turns on and solenoid valve opens immediately. This event will maintain until pushbutton Reset is press. When pushbutton Reset is pressed, all the conveyor motors, solenoid valve and Run indicator lamp need to turn off.

Produce the required ladder diagram program using SET/RSET instruction to operate the system.
(12 marks)

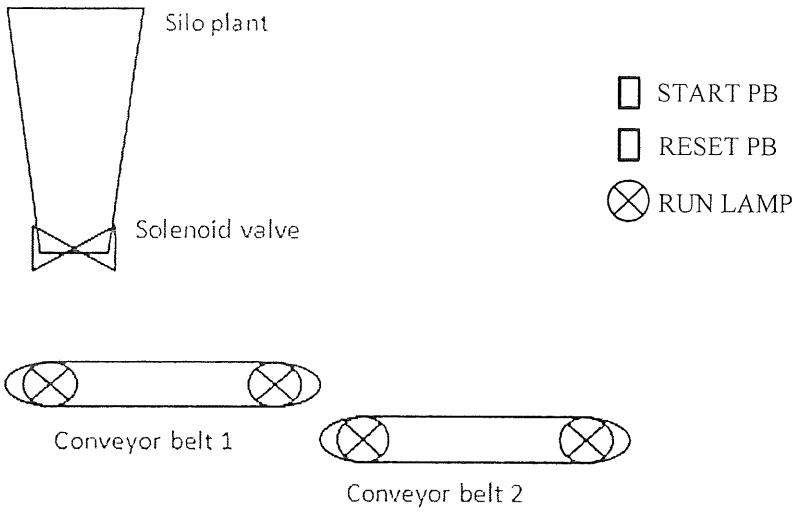
Silo plant
Solenoid valve
START PB
RESET PB
RUN LAMP
Conveyor belt 1
Conveyor belt 2

Figure 2

QUESTION 4

a) Describe the operation of the following counter instruction:

i. CNT (2 marks)

ii. CNTR (3 marks)

b) Refer to the ladder diagram program in Figure 3. Describe the operation of the ladder diagram.

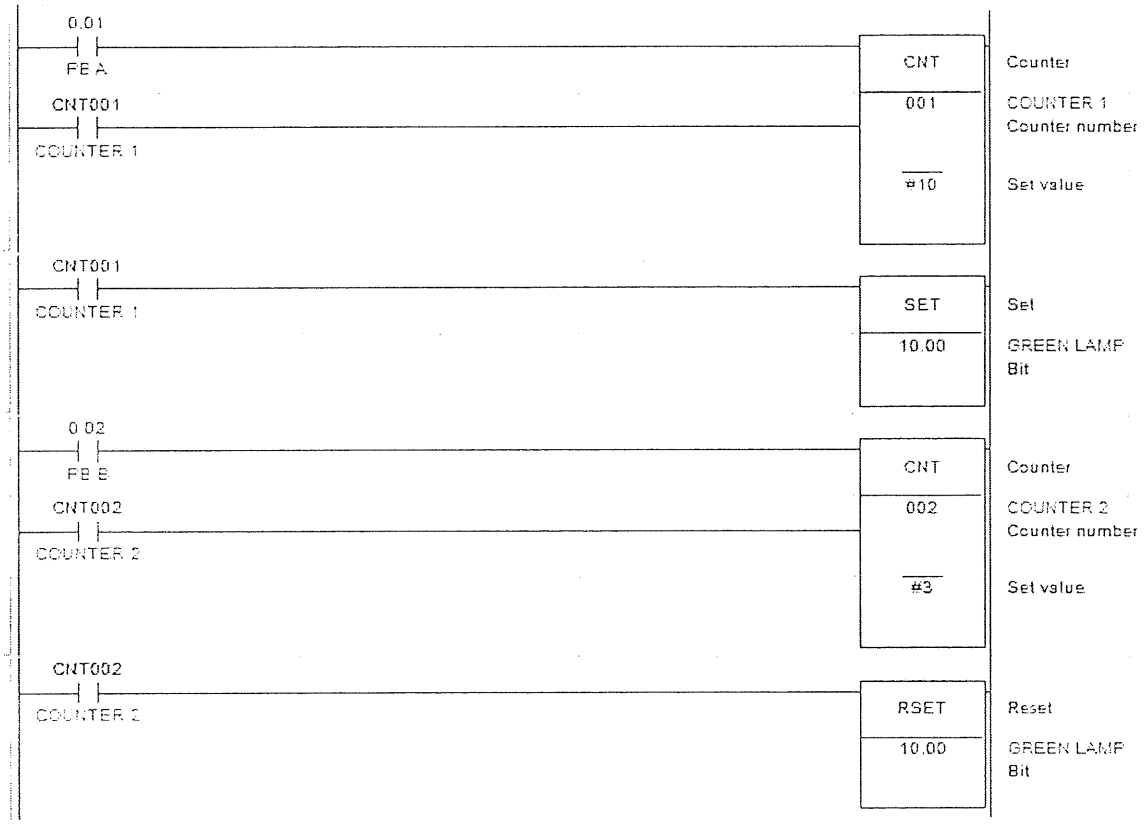

Figure 3

(5 marks)

c) Figure 4 shows a conveyor sorting line of a box packaging. By pressing the Start pushbutton, the conveyor motor will turn on. The operator will then place boxes on the conveyor and the boxes first need to go to Station 1. A total of 20 boxes must go to Station 1 and this is monitor using sensor CNT1. After that, an indicator lamp needs to turn on to show station 1 is full and at the same time a stopper will extend to block the path and divert the boxes to go to Station 2. A total of 10 boxes then need to go to Station 2 and it is monitor using sensor CNT2. When done, another indicator lamp needs to turn on to show station 2 is full and conveyor motor also stops. The operator must press Reset pushbutton to reset the counters and turn off all the outputs (stopper and indicator lamps) before the operation can be start again.

Produce the ladder diagram program for this application.

Use single solenoid valve for the stopper to operate.

(15 marks)

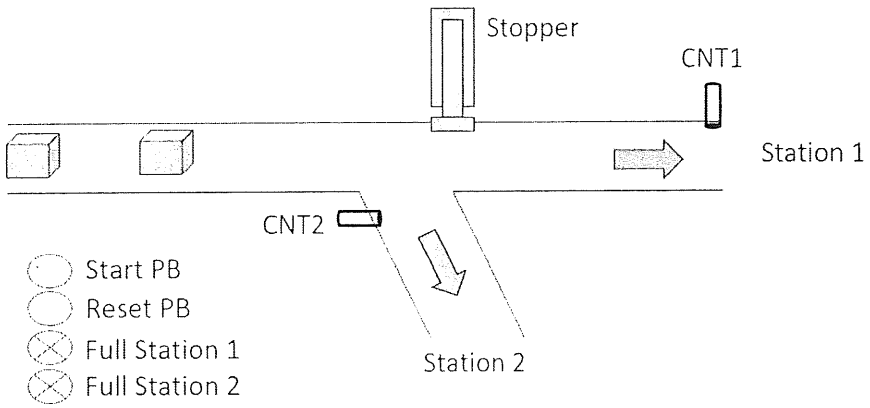

Figure 4

----------End of question----------