

**UNIVERSITY COLLEGE TATI (UC TATI)****FINAL EXAMINATION QUESTION BOOKLET**

COURSE CODE	: BMT 2063 / BET 2063
COURSE	: PROGRAMMABLE LOGIC CONTROLLER
SEMESTER/SESSION	: 2 – 2024/2025
DURATION	: 3 HOURS

**Instructions:**

1. This booklet contains **5** 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 8 PRINTED PAGES INCLUDING COVER PAGE**

**QUESTION 1**

- a) Define the meaning of PLC to the IEC 61131-1 standard. (5 marks)
- b) Describe the following advantages of using PLC:
- i) Easier troubleshoot (2 marks)
  - ii) Communication capability (2 marks)
- c) Describe the different types of devices that PLC can control based on the types of data signals they receive. (6 marks)
- d) The architecture of PLC refers to its hardware, software or to a combination of both.
- i) Name the **two** types of this architecture. (2 marks)
  - ii) Describe the architecture that you named above. (3 marks)

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**QUESTION 2**

- a) PLC unit can be chosen either in compact unit or modular unit.  
List **five** characteristics of a compact PLC unit.  
(5 marks)
- b) The central processing unit (CPU) of a PLC control all the PLC activities and does a repetitive process known as scanning. Identify the **three** processes that occurs during scanning.  
(3 marks)
- c) Describe 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 output module (3 marks)
  - ii. Relay based output module (3 marks)
  - iii. Transistor based output module (3 marks)

**QUESTION 3**

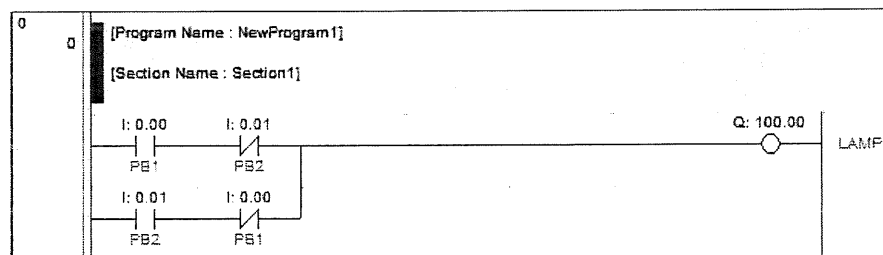
- a) List the **five** systematic approaches in the correct order when programming a PLC.

(5 marks)

- b) Figure 1 shows a ladder diagram for an exclusive OR logic input condition.

i. Describe the operation of the ladder diagram. (3 marks)

ii. Identify the usage of this logic condition. (1 mark)

**Figure 1**

- c) Describe the meaning of latching instruction.

Provide your answer with an example of a latching ladder diagram.

(3 marks)

- d) Describe how the instruction of SET and RSET operates in a ladder diagram.

(4 marks)

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- e) A ON pushbutton and a OFF pushbutton are connected to the input terminal to turn on and off a lamp connected to the output terminal. The ladder diagram developed by the programmer uses SET and RSET instruction as shown in Figure 2.

Describe the reason why the programmer uses normally closed contact for the OFF pushbutton in front of the RSET instruction.

(4 marks)

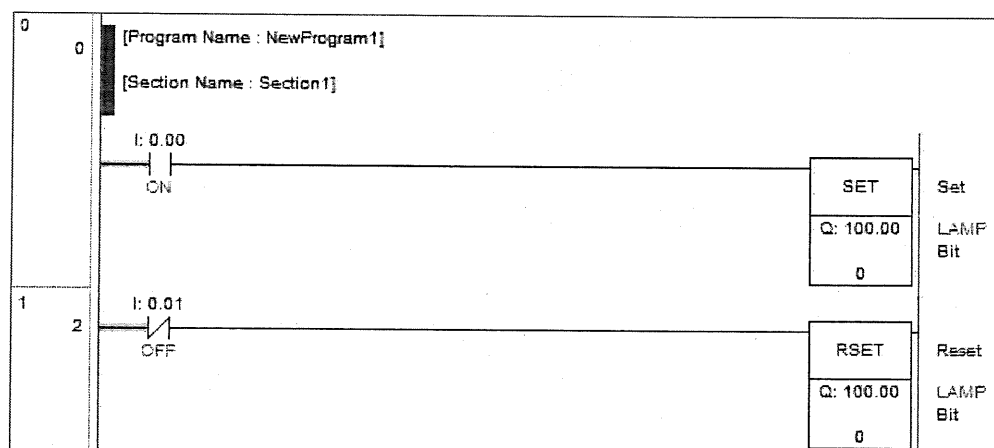
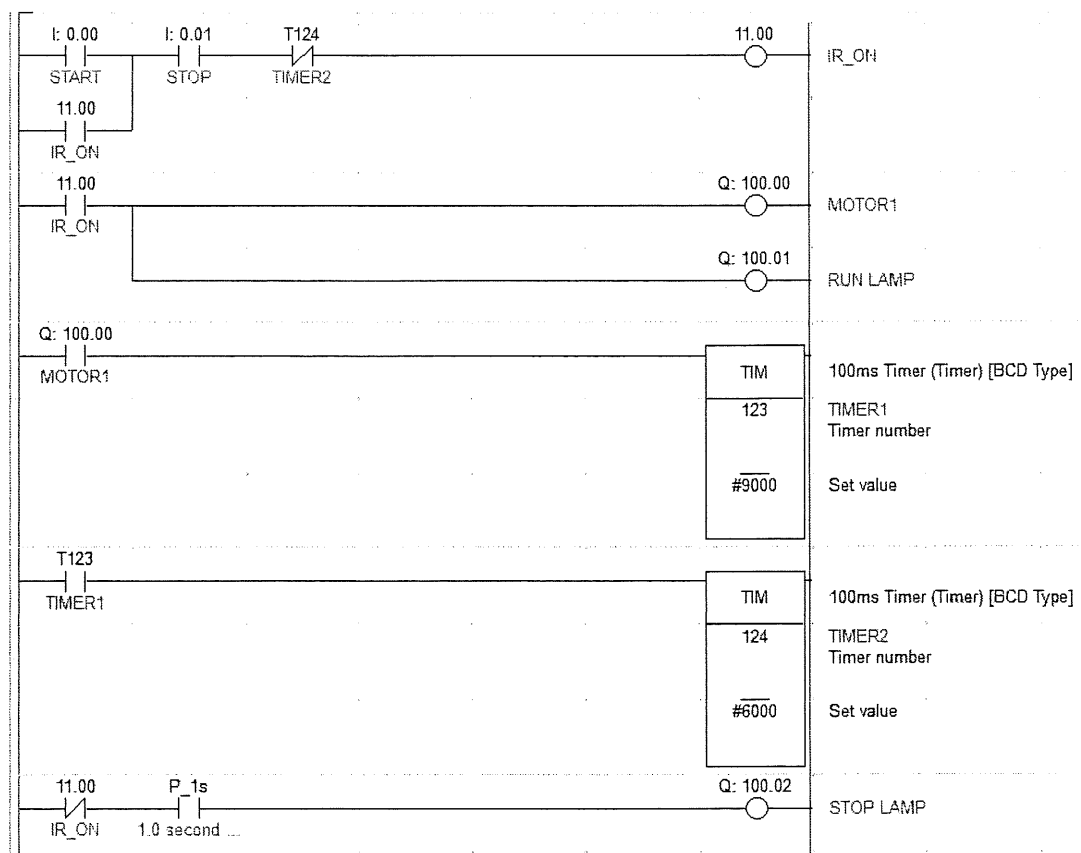


Figure 2

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**QUESTION 4**

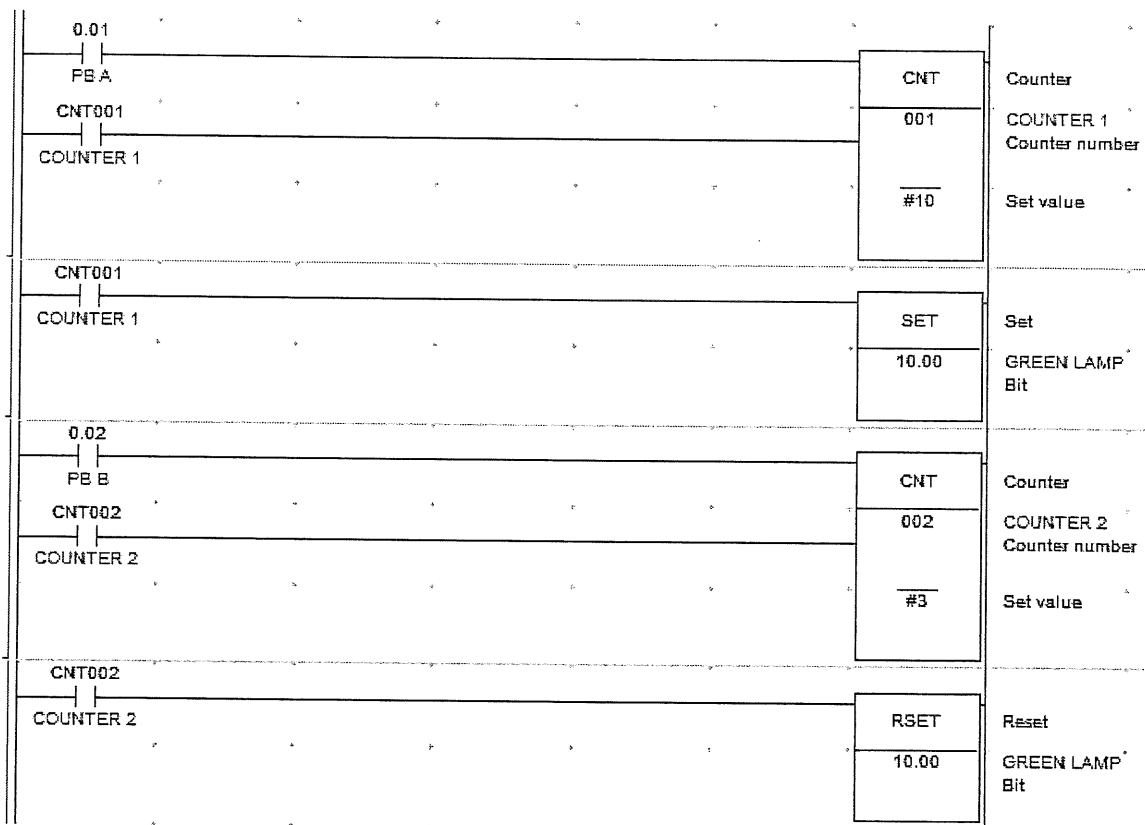
- a) Describe the **three** advantages of using timer instruction in PLC system. (6 marks)
- b) Briefly explain the operation of timer instruction for Omron PLC. (4 marks)
- c) Refer to the ladder diagram program in Figure 3.
- Calculate the length of timer for Timer1. (1 mark)
  - Calculate the length of timer for Timer2. (1 mark)
  - Describe the operation of the ladder diagram in detail. (8 marks)

**Figure 3**

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**QUESTION 5**

- a) Describe the difference between CNT instruction and CNTR instruction.  
(3 marks)
- b) Refer to the ladder diagram program in Figure 4. Describe the operation of the ladder diagram.



**Figure 4**

(5 marks)

c) Figure 5 shows a conveyor line for box shipping container. The process runs as follow:

- By pressing Start pushbutton, the conveyor motor turns on and the worker will place the box on the conveyor.
- The box will move towards the end of the conveyor to enter the shipping container. The shipping container will only accept 10 boxes.
- When it has completed accepting 10 boxes, the conveyor motor must stop and full indicator lamp turns on.
- The Reset pushbutton need to be press to reset the counter and the worker can start the operation again.

Produce the ladder diagram program for this operation.

(12 marks)

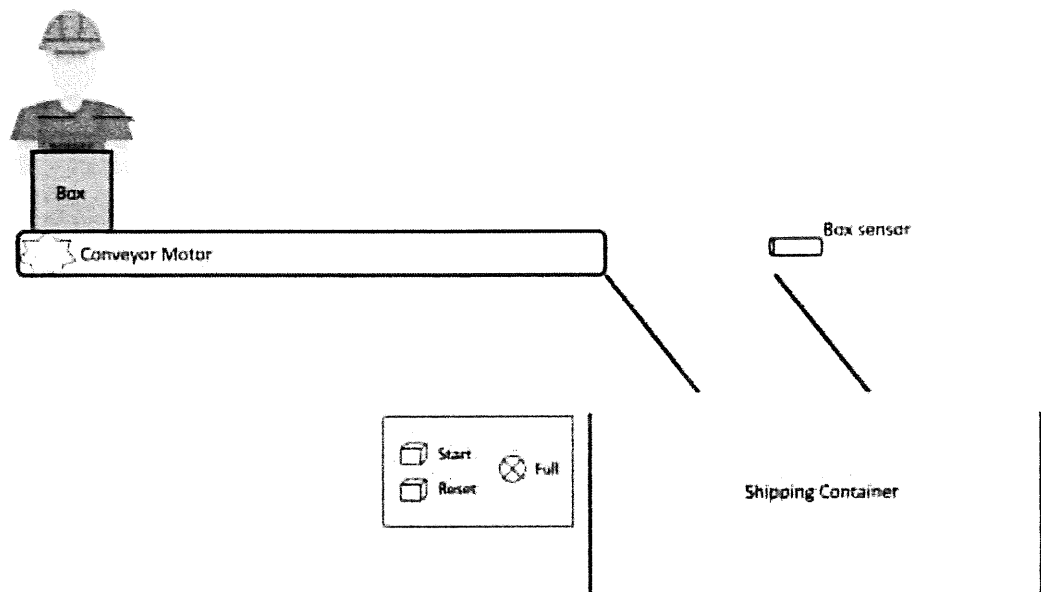


Figure 5

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