UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DMT 2113
COURSE	: PROGRAMMABLE LOGIC CONTROLLER I
SEMESTER/SESSION	: 2-2022/2023
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 illustrate sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

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

THIS BOOKLET CONTAINS 5 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a. Give the definition of Programmable Logic Controller (PLC). (3 marks)

b. State three (3) advantages of Programmable Logic Controller (PLC). (3 marks)

c. List four (4) PLC input or output components that usually used in the lab. (4 marks)

d. Draw the symbols for:

i. Roller limit switch (1 mark)

ii. Relay box (1 mark)

iii. Solenoid valve (1 mark)

e. Figure 1 shows the digital logic diagram.

i. State the Boolean equation for digital logic. (4 marks)

ii. Produce the Ladder Diagram Rung (LDR) from the given gate logic. (8 marks)

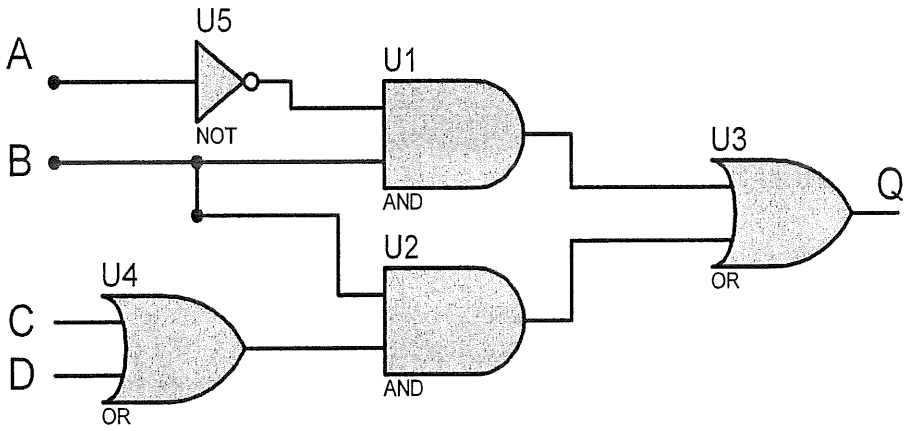

Figure 1

QUESTION 2

a. List **four (4)** PLC programming languages. (4 Marks)

b. State three **(3)** steps in PLC operation. (3 marks)

c. For the following Boolean equation, produce the ladder logic rung. (6 Marks)

$$X = (ABC + D) * E$$

d. From Figure 2:

i. State the Boolean equation for the output. (4 Marks)

ii. Produce the ladder diagram rung (LDR) from the equation in question d (i). (8 Marks)

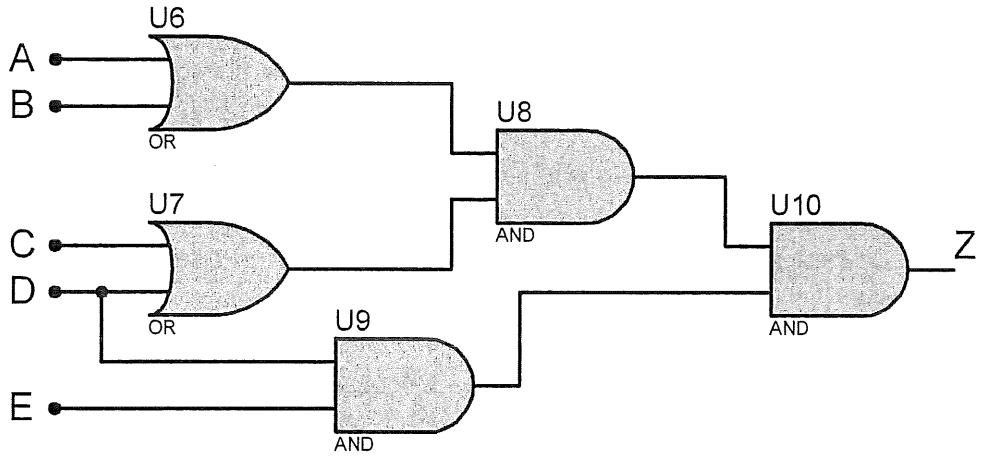

Figure 2

QUESTION 3

a. State **four (4)** differences between Programmable Logic Controller and computers. (4 marks)

b. By using 3/2-way single solenoid valve with spring return and single acting cylinder, the condition for the cylinder to extend and retract is as description given below: -

- By pressing Pushbutton 1 and Pushbutton 2, the cylinder will be extended.
- Only after the cylinder is fully extended and Pushbutton 3 is pressed, the cylinder will be retracted.

By referring to the above condition,

i. Illustrate the pneumatic circuit diagram. (3 marks)

ii. Illustrate the PLC input/output wiring (direct wiring). (3 marks)

iii. Produce a Ladder Diagram for the sequence above. (**using SET/RSET only**) (5 marks)

c. Figure 3 shows a ladder diagram for a condition that should be working as below when: -

- Press PB1, lamp 1 will be on and maintain on after PB 1 is released.
- Press PB2, lamp 1 will be off.
- Press PB3 and PB4, lamp 2 will be on. If pushbuttons is released, lamp 2 will be off.

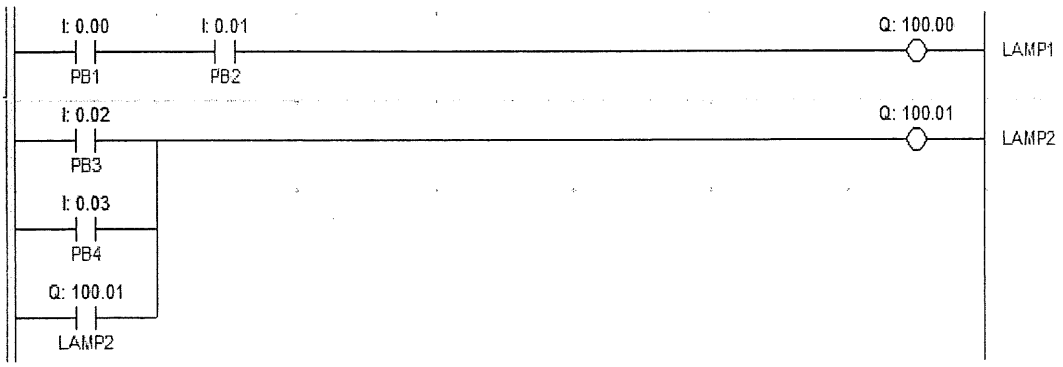

Figure 3

The problem is L1 and L2 is not turning ON and OFF as the condition given above. Troubleshoot and redraw / rewrite the ladder diagram above according to the given condition.

(10 marks)

QUESTION 4

a. The condition for the cylinder to extend and retract is as description given below: -

- Cylinder A is to be extending after Pushbutton 1 and Pushbutton 2 is pressed.
- Only after cylinder A is fully extended then, cylinder B will be extending.
- After cylinder B fully extended, confirm by limit switch, both cylinder A and B will retract at the same time.

***(use double solenoid valve and double acting cylinder)**

By referring to the above condition,

i. Draw the pneumatic circuit with proper labeling. (6 marks)

ii. Illustrate the PLC input/output and electrical wiring for the system. (6 marks)

iii. Illustrate the electrical wiring diagram for the system. (3 marks)

iv. Produce the ladder diagram rung. (Use coil) (10 marks)

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