UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DEI 2053
COURSE	: PROGRAMMABLE LOGIC CONTROLLER
SEMESTER/SESSION	: 1-2024/2025
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. State four (4) criterias in selecting the PLC. (4 marks)

d. By using appropriate diagram, draw the following type of relay.

i. SPDT (1 mark)

ii. DPST (1 mark)

iii. DPDT (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)

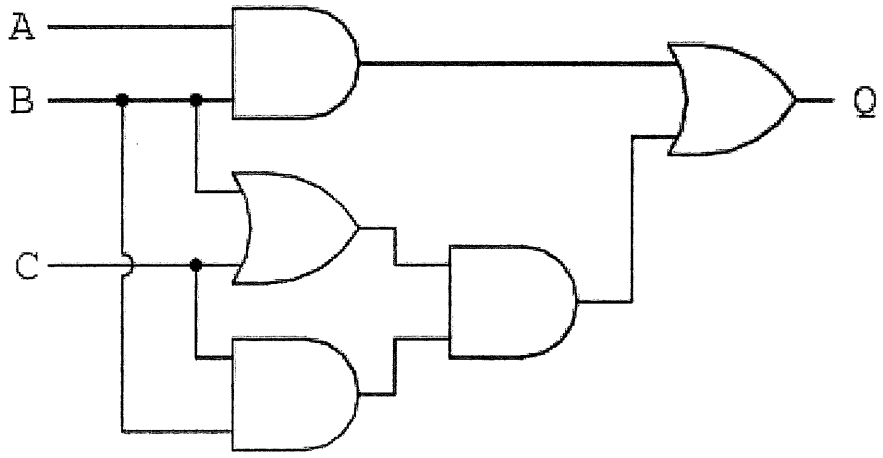

Figure 1

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)

$$X = B.(CB + DC)$$

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)

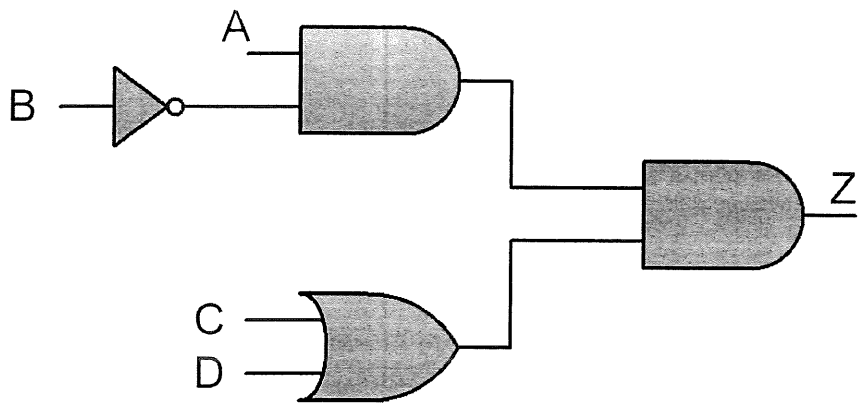

Figure 2

QUESTION 3

a. List four (4) types of modules that every PLC needs.

(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, and the cylinder in retract position confirm by limit switch, 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.

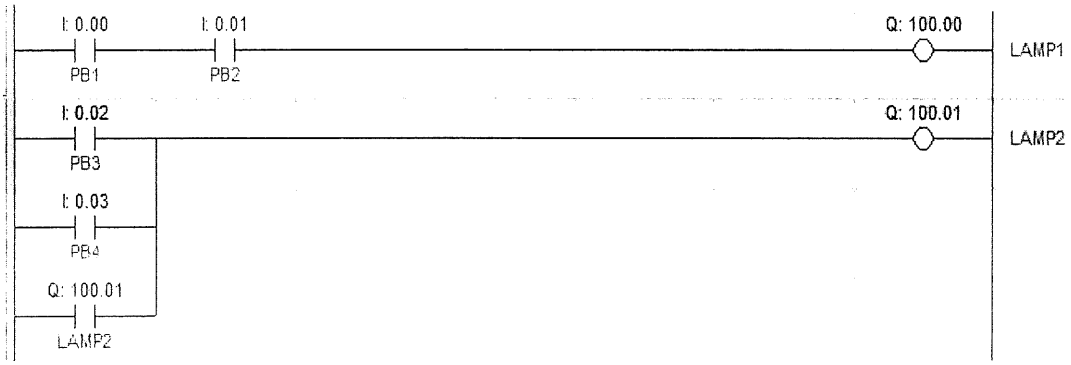

Figure 3

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 single solenoid valve and single acting cylinder)**

By referring to the above condition,

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

ii. Illustrate the PLC input/output wiring. (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 ----------