UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UCTATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DMT 1073
COURSE	: AUTOMATION TECHNOLOGY
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 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 5 PRINTED PAGES INCLUDING COVER

QUESTION 1

a) State the first "automation technology" started in craft and industry. (1 mark)

b) List TWO (2) benefits of automation. (4 marks)

c) Describe the main difference between hard automation and programmable automation. (6 marks)

d) Draw the black box representation of technical system. (3 marks)

e) List any THREE (3) graphical description tools most engineers used which are standardized and internationally understood. (6 marks)

QUESTION 2

a) State THREE (3) classifications of sensors. (3 marks)

b) List THREE (3) sensors with electronic switch output. (3 marks)

c) Inductive proximity sensors consist of an electrical resonant circuit, a flip-flop and an amplifier,

i. Draw the symbol of the sensor (3 marks)

ii. State the materials which can be detected by this sensor (1 mark)

iii. Draw the function circuit diagram of the sensor (6 marks)

iv. Describe how it operates when voltage is applied (4 marks)

d) A 3-bit binary encoder disk is shown as in Figure 1.

i. Write the binary code for 45^0 - 90^0 angle (2 marks)

ii. Write the binary code for 90^0 - 135^0 angle (2 marks)

iii. Convert the binary code in d(i) to decimal (1 mark)

iv. Convert the binary code in d(ii) to decimal (1 mark)

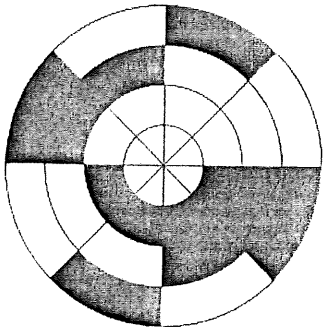

Figure 1

e) Describe how ultrasonic sensor is used to measure the distance of an object. (4 marks)

QUESTION 3

a) State a difference between single acting cylinder and double acting cylinder in terms of active ports. (2 marks)

b) There are two simplest methods to activate a DC motor,

i. State both methods (2 marks)

ii. Sketch schematic diagram for both methods (4 marks)

c) Since it is not possible or practical to keep changing the motor wiring, a so-called pole reversal circuit is used in DC motors to reverse the direction of rotation. Sketch the pole reversal circuit. (10 marks)

d) Figure 2 shows the pneumatic circuit diagram for controlling a linear actuator.

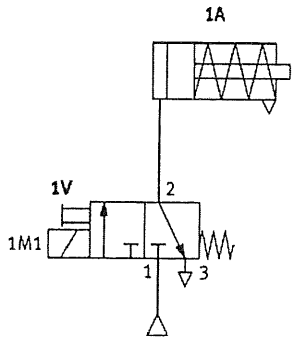

Figure 2

i. List all the components used (2 marks)

ii. Sketch an electrical wiring diagram to **directly control** the actuator using a switch (3 marks)

iii. Sketch an electrical wiring diagram to **indirectly control** the actuator using a switch (5 marks)

QUESTION 4

a) State the main purpose of CNC (Computer Numeric Controller) (2 marks)

b) Programmable Logic Controllers (PLC) is one of the most frequently used controllers in automation technology.

i. List all the system components in PLC (6 marks)

ii. Sketch the structure of the system components in b(i) (6 marks)

c) Draw a Dominant OFF wiring diagram. (4 marks)

d) Draw a Dominant ON wiring diagram. (4 marks)

---------- **End of questions**----------