

Exam Date & Time: 17-May-2022 (10:00 AM - 01:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SIXTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY 2022

INDUSTRIAL AUTOMATION [ICE 3252]

Marks: 50

Duration: 180 mins.

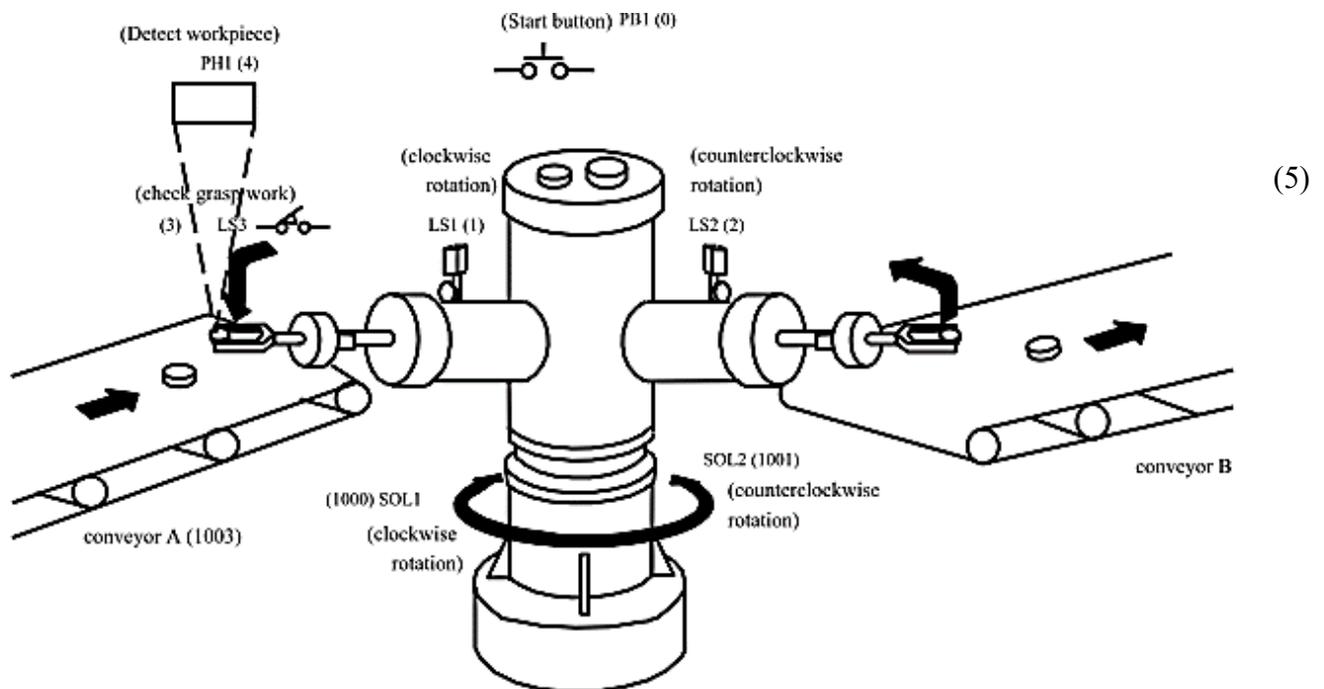
A

Answer all the questions.

Missing data may be suitably assumed

1) Develop a ladder logic with the following conditions:

- When the start button is pressed, the robot starts its arm clockwise.
- A)
 - When the robot arm has moved to the position of the work piece on the conveyor A, arm grasps the work piece.
 - When the arm has grasped the work piece, it rotates in counter clockwise.
 - When the arm has rotated to the position of the conveyor B, it releases the work piece.
 - Every eight hours, the robot should give an alarm indication for inspection.



- B) What are different classes of command sets available in the HART protocol? Brief each with two examples. (3)

- C) (2)

In SCADA list all the threats introduced by distributed control architecture and how it must be addressed in the design of the system?

2) Generate a 16-bit CRC code for the 0409H frames. (5)

A)

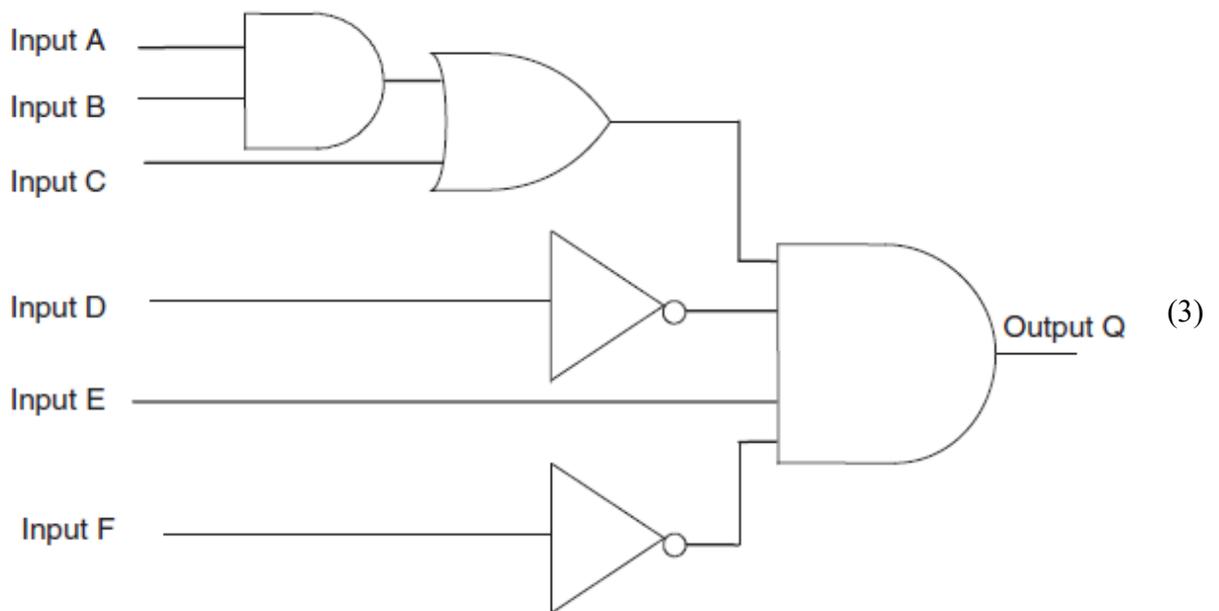
B) Describe the communication models used in Fieldbus. Give one example for each method. (3)

C) Discuss about the communication profiles used in Profibus technology. (2)

3) Without simplification develop the instruction list program for the Boolean expression given below. (4)

A) $Y = \overline{(AB\bar{C}D + AB\bar{C}\bar{D} + \bar{A}BCD + \bar{A}\bar{B}CD)} + D$ (4)

B) Develop a ladder logic and FBD program for the logic circuit given below. (3)



C) Elucidate two transmission modes in MODBUS communication with their packet format. (3)

4) Explain the generalized DCS system with a diagram. (5)

A)

B) Compare PLC with DCS (any 3 comparisons). (3)

C) Write a structured text program for finding the factorial of a number. (2)

5) (4)

Distinguish three LCU architecture configurations with respect to any four architecture parameters.

- A)
- B) Describe the manual backup, hot standby redundancy and multiple active redundant controllers- security approaches. (4)
- C) Illustrate the different communication modes available in the HART protocol. (2)

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