

End Semester Examinations - 2015-16 Even Semester - May 2016

14EI3014 Industrial Automation

Set B

Time : 3 hrs
Total Marks: 100

1. a. Describe the role of Industrial Automation in ensuring overall profitability of industrial production system. Give examples as appropriate. (10)

b. Elaborate on the functional elements of the industrial automation system. (10)

OR

2. a. Incorporation of P-I action may lead to instability in the closed loop performance- justify. Also propose a controller for flow process with proper reasoning. (12)
- b. What are the various actuators used in industrial automation? (6)
- c. Define SCADA (2)

3. a. Explain with an example the principle of ratio control. Elaborate with a block diagram any one scheme for achieving ratio control. (12)

b. Why the controller used for ratio control is normally P-I type ? (5)

c. When would you recommend the use of feedforward controller? What is the advantage of using this control? (3)

OR

4. a. Explain the architecture of PLC with the required diagrams. (10)

b. With an example, explain the use of retentive timer. (4)

c. Design a PLC program that will execute the following. (6)

- i. Turn ON a non-retentive timer when a switch is closed (preset value of timer is 10 s)
- ii. Timer is automatically reset by a programmed transitional contact when it times out.
- iii. Counter counts the number of times the timer goes to 10 s.
- iv. Latches on a light at the count of 5.

5. a. Write a PLC program to implement the box stacking process. This application requires the control of conveyor belt that feeds a mechanical stacker. The stacker can stack various numbers of cartons of ceiling tile onto each pallet (depending on the pallet size and the preset value of the counter). When the required number of cartons has been stacked, the conveyor is stopped until the loaded pallet is removed and an empty pallet is placed onto the loading area. A photo sensor will be used to provide count pulses to the counter after carton passes by. In addition to a conveyor motor start/stop station, a remote reset button is provided to allow the operator to reset the system from the forklift after an empty pallet is placed on to the loading area. The operation of the system can be summarised as follows:

- The conveyor is started by pressing the start button.
- As each box passes the photo sensor, a count is registered.
- When the preset value is reached the conveyor turns off.
- The forklift operator removes the loaded pallet.
- After the empty pallet is in position, the forklift operator presses the remote reset button, which then starts the whole cycle over again. (12)

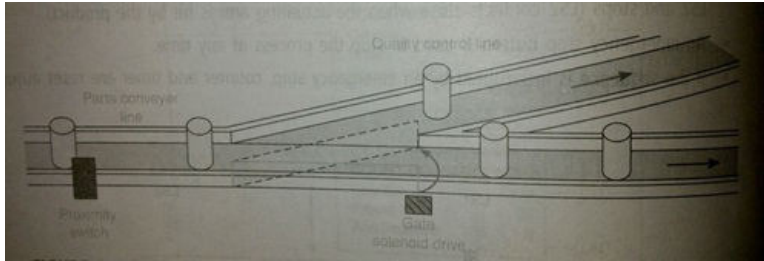
b. Describe briefly about PLC register basics, timer functions and counter functions. (8)

OR

6. a. Write a program to implement the process in the diagram. A counter must be programmed as part of a batch-counting operation to sort parts automatically for quality control. The counter is installed to divert one part out of

every 1000 for quality control. The circuit operates as follows:

- A start/stop push button is used to turn the conveyor ON/OFF
- A proximity sensor counts the parts as they pass by on the conveyor.
- When a count of 1000 is reached, the counter's output activates the gate solenoid, Diverting the part to the inspection line
- The gate solenoid is energised for 2seconds, which allows enough time for the part to continue to the quality control line.
- The gate returns to its normal position when the time 2 seconds is over.
- The counter resets to zero and continues to accumulate counts.
- A reset push button is provided to reset the counter manually also. (10)



b. Explain in detail about various PLC digital bit functions and applications. (10)

7. a. What is Computer Numerical Control? Explain about the algorithm used for position control in CNC.(10)
- b. Why should a feed drive operate in constant torque mode, while the spindle drive should operate in a constant power mode? (10)

OR

8. a. With neat sketch explain Sequenced extension-retraction operation for two cylinders. (7)
- b. Explain the construction and working principle of a direct acting type pneumatic valve positioner. What are the limitations of this type of positioners? (7)
- c. Identify the factors those affect the sensitivity of a flapper nozzle amplifier. (6)
9. a. With help of neat diagram explain the embedded system architecture and the different types of processors used. (15)
- b. List out the difference between Microprocessor and Microcontroller. (5)

Wishing you All the Best
