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B.E. / B.Tech. DEGREE EXAMINATION, MAR 2018

Sixth Semester

Electrical and Electronics Engineering

14UEE905 – PROGRAMMABLE LOGIC CONTROLLER AND SCADA
(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

(Smith chart may be permitted)

PART A - (10 x 1 = 10 Marks)

1. PLCs are _____ designed for use in the control of a wide variety of manufacturing machines and systems.

    (a) Special-purpose industrial computers   (b) Personal computers
    (c) Electromechanical systems   (d) All the above

2. In a current sinking DC input module, _____.
    (a) The current flows out of the input field device
    (b) Requires that a AC sources be used with mechanical switches
    (c) The current flows out of the input module
    (d) Currents can flow in either direction at the input module

3. Which of the following statements is not correct?
    (a) The PLC rung output [-( )-] is a discrete output instruction or bit in memory.
    (b) Each rung of the ladder logic represents a logical statement executed in software - inputs on the right and outputs on the left.
    (c) Input and output instructions in ladder logic do not directly represent the switches and actuators.
    (d) PLC input instructions are logical symbols associated with voltage at the input module terminals.

4. Which of the following Relay Ladder Logic (RLL) applications is not normally performed in early automation systems?
   (a) On/off control of field devices
   (b) Logical control of discrete devices
   (c) On/off control of motor starters
   (d) Proportional control of field devices

5. A SCADA system performs Data acquisition, Networked data communication, _____ and control.

   (a) Data representation   (b) Microcontroller
   (c) Distributed control system   (d) None of these

6.Components of a modern SCADA system are
   (a) Field devices
   (b) Controllers, Remote I/O's and Distributed I/O's
   (c) Human Machine Interface (HMI), SCADA Servers/Clients
   (d) All above

7. Why does SCADA software can communicate with many kinds of PLC's?
   (a) SCADA software flexibility contents many device drivers
   (b) SCADA software fixes many device drivers
   (c) SCADA software supports popular PLC drivers
   (d) SCADA software supports popular field devices

8. Distributed Control Systems (DCS) and SCADA are
   (a) DCS is process oriented, SCADA is data acquisition oriented
   (b) SCADA is process oriented, DCS is data acquisition oriented
   (c) DCS is object oriented, SCADA is structure oriented
   (d) DCS is machine oriented, SCADA is process oriented

9. Fault tolerance of SCADA system is
   (a) Ability to connect with many I/O devices
   (b) Ability to recover communication connection
   (c) Ability to manage and coordinate system errors
   (d) Ability to restart running application

10. In industrial process control a _____is a telemetry device which converts measurements from a sensor in to a signal and sends it to a control device located a distance away.

   (a) Transducer   (b) Sensor
   (c) Transmitter   (d) Controller

11. How the PLC is applied in automation? Enumerate two advantages of PLC.

12. Enumerate the factors to be considered on a PLC system after installation based on operating environment. Also mention some basic electrical problems in PLC.

13. Define SCADA and mention the most important objectives of SCADA.

14. State the various operating states of a power system with diagram.

15. Give the functions of SCADA in power distribution system applications.

PART - C (5 x 16 = 80 Marks)

16. ((a) What is PLC? Explain about the components of PLC.   (16)

Or

   (b) Describe the contact (input) functions and coil (output) function of the PLC. Create basic ladder diagrams from a sequence of operational steps. Also list the major steps in creating a PLC program for an industrial situation and discuss the content of each of these steps with the help of flowchart.   (16)

17.(a) i) Discuss and demonstrate how the PLC handles overflow and negative numbers for the ADD and SUBTRACT functions. Also list and define the six basic COMPARE functions.   (8)

      ii) Describe the operation of the SKIP and MASTER CONTROL RELAY functions. Apply the SK and MCR functions to operational applications.   (8)

Or

   (b i) Discuss the BLOCK MOVE function and apply the BLOCK MOVE function to industrial problems in combination with other PLC functions.   (8)

      ii) Compare the operation of a conventional drum switch with a PLC LADDER program and a PLC SEQUENCER program. Describe the other major PLC SEQUENCER functions and their application.   (8)

18. (a) (i) How SCADA is applied to Distribution Automation? Mention the advantages of Distribution Automation through SCADA?   (6)

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(ii) With the help of neat block diagram of a typical SCADA system, discuss in detail the various components involved in SCADA for Automation Systems. (10)

Or

(b) With a neat block diagram, discuss the following as applied to Remote Terminal Unit: (16)

      (i) Communication interface

      (ii) Data Processing Master Stations

      (iii) Digital Input and Digital Output Variables

      (iv) Analog Input and Analog Output Variables

19. (a) (i) Explain why communication equipment's are important in Distribution Automation system using IEC 61850 and draw the simplest SCADA configuration employing a single computer. (6)

(ii) Discuss the various Automatic substation control functions arranged through SCADA systems. Enumerate the different control centre involved in Energy Management System for a large inter-connected system and discuss the typical objectives of system control centre step by step. (10)

Or

(b) Draw the power system state transition diagram and discuss the various operating states of the power system in detail to make the system secure. (16)

20. (a) With a neat operator station for a variable speed drive and connection diagram from PLC to VS drive terminal block, discuss the PLC application for speed control of AC motors with variable speed (VS) drives. (16)

Or

(b) Explain application of PLC for speed control of AC motor. (16)

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