PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKE UP EXAMINATION – JAN 2023

Course Code: EEE1004

Course Name: Fundamentals of Industrial Automation

Program   : B.Tech

Date: 30-JAN- 2023

Time: 01:00 PM to 04:00PM

Max Marks: 100

Weightage:50%

Instructions:

(i) Read the all questions carefully and answer accordingly.
(ii) Draw the sketches neatly

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO marks.   (10Qx 2M= 20M)

1. ------------------ is an industrial grade computer that is capable of being programmed to perform control functions.
   a) Programmable Logic Controller b) Discrete Controller c) Advanced Process Control
   d) HMI   (C.O.No.1) [Knowledge level]

2. The relay logic is
   a) is not programmable b) is operated in analog system c) does not consists of memory
   d) All the above   (C.O.No.1) [Knowledge level]

3. In Parallel communication data is transmitted

   a) one bit at a time b) 4 bits at a time c) 8 bits at a time d) 16 bits at a time

                                                          (C.O.No.1) [Knowledge level]

4. Vertical lines of the ladder diagram represent

   a) Rungs b) Power rails c) Switches d) Output   (C.O.No.2) [Knowledge level]

5. The command used to load an operand is
   a)LOAD   b) LT   c) LD   d) LA   (C.O.No.2) [Knowledge level]

6. HMI stands for
   a) human-machine interface b) human-machine interaction c) human-motor interface
   d) human-machine interference   (C.O.No.2) [Knowledge level]

7. Communication technology used for second generation of SCADA is

   a) Bluetooth   b) LAN   c) Wireless   d) Satellite   (C.O.No.3) [Knowledge level]

8. Fourth generation of SCADA is called
   a) Monolithic b) distributed c) Networked d) Web based   (C.O.No.3) [Knowledge level]

9. Level 3 in DCS configuration is
   a) Direct control b) Plant supervisory c) Production control d) Production scheduling
                                                                  (C.O.No.4) [Knowledge level]

10. In DCS data transfer is via

    a)LAN   b) wireless c) Satellite d) None of the above   (C.O.No.4) [Knowledge level]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.   **(4Qx10M=40M)**

11. Many industrial processes require the PLC to switch a DC motor ON or OFF. Sometimes a PLC is required to reverse the direction of rotation of the motor. This can be done using relays to reverse the direction of the current applied to the armature coil. Draw a circuit which can be used to reverse the speed of the motor using the relay and explain the operation.
                                                                  (C.O.No.1) [Comprehension]

12. A small manufacturing industry uses a single sensor/transducer for the plant control by SCADA. Identify the suitable DAS for the above plant and explain the functional block diagram of it with neat sketch.   (C.O.No.3) [Comprehension]

13. SCADA systems organize multiple technologies that allows to process, gather and monitor data at the same time to send instructions to those points that transmit data. Identify the role of SCADA in power generation, transmission, distribution systems.
                                                                  (C.O.No.3) [Comprehension]

14. The key attribute of a DCS is its reliability due to the distribution of the control processing around nodes in the system. This mitigates a single processor failure. If a processor fails, it will only affect one section of the plant process. Compare the DCS with SCADA in this context.   (C.O.No.4) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries TWENTY marks.   **(2Qx20M=40M)**

15. a) A plant operation is represented by the functional block diagram given below. Explain the working of the plant or process. Sketch the ladder diagram for the given functional block diagram.   (C.O.No.2) [Application]
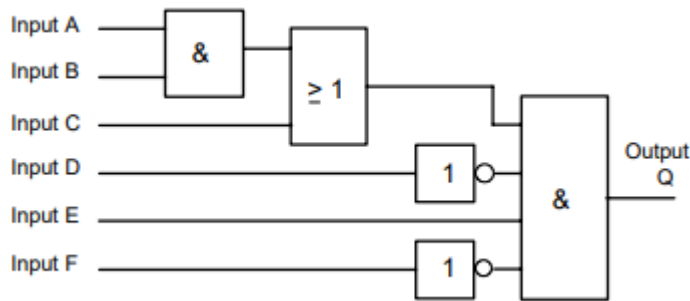
Figure 15a. Functional block diagram

b) ABB has used sequential unction chart to represent the plant operation. The plant operation is, State 1 occurs if the transfer condition IN 1 occurs, but if IN 2 then state 2 or if IN 3 then state 3. Identify the SFC configuration which represents the plant operation and sketch the same. (C.O.No.2) [Application]

16. a) For the sequential function chart shown in Figure 16a explain the process and draw the corresponding ladder program (C.O.No.2) [Application]
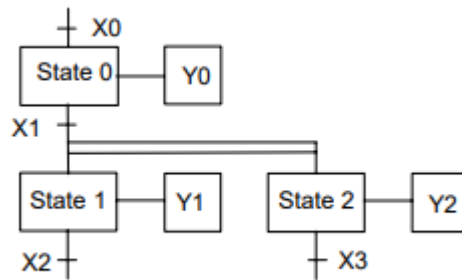

Figure 16a. Sequential function chart

b) Siemens has used sequential function chart to represent the plant operation. The plant operation is, When IN 1 occurs then state 1, state 2 and state 3 are all simultaneously realised. Identify the SFC configuration which represents the plant operation and sketch the same (C.O.No.2) [Application]