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Question Paper Code: 46602

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

Sixth Semester

Electronics and Instrumentation Engineering

14UIC602 - LOGIC AND DISTRIBUTED CONTROL SYSTEMS

(Regulation 2014)

(Common to Instrumentation and Control Engineering)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. PLCs having less than _____ inputs and outputs are called as small PLC
(a) 50 (b) 100 (c) 150 (d) 200
2. An example of module addressing is I:1.0/2 here '1' represents
(a) bit number (b) word number (c) slot number (d) File number
3. A disadvantage of centralized control is
(a) Installation cost is medium (b) Medium trained people is enough
(c) Reprogramming is easy (d) Single point failure is high
4. If you expect to change control strategy during or after the initial installation has been completed and expansion is also a consideration in future, then _____ control be advantageous.
(a) Distributed (b) Direct Digital (c) Hybrid (d) Analog
5. Which of the following capabilities is/are typically required of an operator interface in automation?
(a) Access the state of the process (b) Control/modify parameters
(c) Intervene in the process (d) All the above

6. A Ladder rung with an input and output condition can be most compared to
- (a) An IF-THEN statement (b) A FOR loop
(c) A GOTO jump (d) A COP Instruction
7. The advantages of position algorithm is
- (a) Bump less transfer (b) Anti reset wind up
(c) Reference position (d) Calculate only incremental output
8. The maximum frequency component of $g(t)$ is f_m . To recover the signal $g(t)$ exactly from its samples it has to be sampled at rate
- (a) $f_s \geq 2f_m$ (b) $f_s \leq 2f_m$ (c) $f_s = 2f_m$ (d) $f_s < 2f_m$
9. Interoperability means
- (a) Functional blocks are standardized
(b) Communication layer are standardized
(c) Field instruments are standardized
(d) LCU's are standardized
10. In HART protocol, use two individual frequencies of _____ and _____ representing digits 0 & 1 respectively.
- (a) 1200 Hz and 2200 Hz (b) 2200 Hz and 1200 Hz
(c) 2300 Hz and 1200 Hz (d) 1100 Hz and 2100 Hz

PART - B (5 x 2 = 10 Marks)

11. List the advantage of programmable controllers over hard wire relay.
12. Write a simple program using PLC to implement the EXOR logic gate.
13. Define word length effect.
14. Define the term 'Commissioning and Configuration' in DCS.
15. Frequency shift keying and phase shift modulation are two popular modulation techniques used for moving binary data. Why?

PART - C (5 x 16 = 80 Marks)

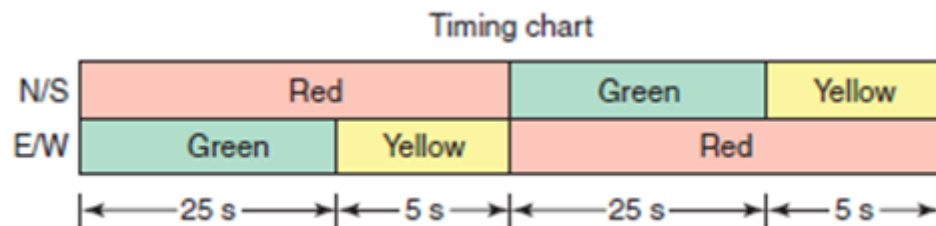
16. (a) Draw the architecture of PLC and explain individual components (16)

Or

- (b) Develop a ladder logic program for a traffic light control system using timers and counters. (16)
17. (a) Write a ladder program to implement an oven temperature ON/OFF control. The set-point temperature is adjusted by means of the thumb wheel switch. Introduce the differential gap is $\pm 1\%$ around the set point. Program itself have to calculate upper and lower limit. Maintain the set point temperature to 400°F . The electric heater will be turned on when the temperature of oven drops to less than lower limit and stay on until the temperature rises above upper limit. (16)

Or

- (b) Program a ladder to control traffic in two way directions using sequencer output instruction (SQU), also mention the advantages of sequencer programming over conventional programming methods. The timing chart is given below. (16)



18. (a) Derive the mathematical expression of position form and velocity form of digital PID algorithm. Mention the major limitation of position algorithm? How to overcome the limitation using by velocity form of PID. (16)

Or

- (b) Construct the Jury Stability table for the following characteristics equation to find the stability. $P(z) = z^4 - 1.2z^3 + 0.07z^2 + 0.3z - 0.08$. (16)
19. (a) Compare Hybrid system, Direct Digital Control and Distributed Control System architectures in detail. (16)

Or

- (b) Describe the typical architecture of Distributed Control System configured in Thermal power plant with neat diagram, also classify the different control architectures configured in the Thermal power plant. (16)

20. (a) Illustrate the functioning of HART bus along with its ISO-OSI model implementation. (16)

Or

(b) Describe the Communication stack of foundation field bus and explain the functionality of each layer in detail. (16)
