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Total Number of Pages : 01

B.Tech  
PEI6I102

6<sup>th</sup> Semester Regular / Back Examination 2018-19

INDUSTRIAL AUTOMATION

BRANCH : AEIE, EIE, IEE

Max Marks : 100

Time : 3 Hours

Q.CODE : F209

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- An equal percentage valve has a maximum flow of 50 cm<sup>3</sup>/s and a minimum of 2 cm<sup>3</sup>/s. If the full travel is 3 cm, the flow at a 1-cm opening will be how much?
- What is the difference an error signal and offset?
- Write two features of Cascade Control.
- Write the mathematical expression of digital PID controllers with usual meanings.
- What is the need of self-latching in ladder diagram?
- What are the three element control of boiler drum level control?
- What are Communication options in DCS?
- Draw simple delay unit of 10 ms in the ladder diagram.
- What is the role of actuator?
- What is semaphore?

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Justify why a PID controller is more preferred over PI controller?
- Explain Multivariable Control with some examples.
- Explain the feedforward control of a distillation column briefly..
- Explain the different selective control schemes by taking suitable examples from process plant.
- Illustrate Digital PID Controllers
- With neat diagram explain the Control Valve characteristics
- Draw the architecture of programmable controller and explain it briefly.
- Explain at least two Ratio Control configurations briefly.
- Distinguish adaptive and selective control configurations briefly.
- Explain the Pneumatic Actuation briefly.
- Explain the thumb rules for designing and tuning of cascade control briefly
- Compare semaphore and regions.

Part-III

Q3 Only Long Answer Type Questions (Answer Any Two out of Four) (16)

The transfer functions for a cascade system are given as  
 $G_{p1}=4/((2S+1)(4S+1))$  ;  $G_{p2}=5/(S+1)$ ;  $G_{i2}=1/(3S+1)$ ; GC1 is a P controller ;  $G_{c2} = 4$ ;  
 $G_{m1}=0.05$ ;  $G_{m2}=0.2$

- Calculate the ultimate value of  $K_{p1}$  for primary controller for which simple feedback and cascade loop go into oscillation
- Compare the offset for simple feedback and cascade loop when  $K_{p1}=20$

Q4 Give a comparison between Distributed vs. Centralized control. Also Describe the system architecture for DCS and its advantage. (16)

Q5 Explain the Electric Actuation devices briefly. (16)

Q6 What is the need of tuning in PID Controller .Also explain Zeigler-Nichols Tuning Method and process reaction curve briefly. (16)