

Reg. No. :

--	--	--	--	--	--	--	--	--	--

Question Paper Code: 45504

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Fifth Semester

Electronics and Instrumentation Engineering

14UEI504 - PROCESS CONTROL INSTRUMENTATION

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Degrees of freedom of a boat are
(a) 1 (b) 2 (c) 3 (d) 4
- U – Tube Manometer is an example of
(a) inherently second order systems (b) two first order systems in series
(c) interacting system (d) non-interacting system
- Most commonly used controller for controlling the temperature is a _____ controller.
(a) P (b) PI (c) PD (d) PID
- The PI controller can be used in _____ control.
(a) flow (b) temperature (c) liquid level (d) multi-capacity process
- IAE means
(a) inverse arithmetic error (b) integral absolute error
(c) internal absolute error (d) none of these
- Which one is the tuning method for design of PID controller?
(a) damped oscillation method (b) Ziegler Nichols method
(c) ultimate cycle method (d) all of the above

7. In boiler drum, swell effect occurs due to
- (a) sudden load (steam demand) increase
 - (b) sudden load (steam demand) decrease
 - (c) feed water pressure variations
 - (d) level variations
8. Three element control means
- (a) feedback
 - (b) feedback + feedforward
 - (c) cascade
 - (d) feedforward+cascade
9. The _____ configuration involves one measurement and one manipulated variable in a single loop.
- (a) cascade control
 - (b) feed forward control
 - (c) feedback control
 - (d) split range control
10. The _____ can be used to control an unmeasured process output in the presence of unmeasured disturbances.
- (a) cascade control
 - (b) ratio Control
 - (c) ratio split range control
 - (d) inferential control

PART - B (5 x 2 = 10 Marks)

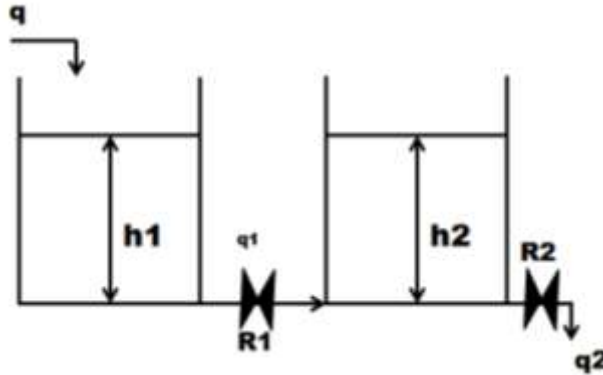
11. Differentiate between servo and regulator operation.
12. Define integral windup.
13. Classify the types of control valve?
14. An equal percentage has a maximum flow of $50 \text{ m}^3/\text{s}$ and a minimum flow of $2 \text{ m}^3/\text{s}$. If the full travel is 3 cm, calculate the flow at a 1 cm opening.
15. Identify the difference between feed-back control and feed forward control?

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Develop the transfer function of first order level process. (8)
- (ii) Develop the mathematical model of first order stirred tank heater. (8)

Or

- (b) (i) Illustrate servo and regulatory operation with an example for each. (8)
- (ii) Consider the system shown in figure. Develop a mathematical model for the system. Assume that the effluent stream from a tank is proportional to the hydrostatic liquid pressure that causes the flow of liquid. Cross-sectional area of tank 1 is A_1 (ft^2) and of tank 2 is A_2 (ft^2). The flow rates q , q_1 , q_2 are in ft^3/min . Take necessary assumptions. (8)



17. (a) Describe the characteristics of ON-OFF and single speed floating controllers. Also explain how they can be implemented using electronic elements. (16)

Or

- (b) Explain the operation of electronic PI and PID controller with suitable circuit diagram. (16)
18. (a) (i) Conclude the operation of Cohen and Coon method with the help of opened control loop. (8)
- (ii) Explain the process reaction curve method of controller tuning. (8)

Or

- (b) (i) Explain the controller settings using Ziegler-Nichols continuous cycling method. (8)
- (ii) In the application of the Ziegler Nichols method, a process begins oscillation with a 30% proportional band in an 11.5 min period. Examine (a) The nominal three mode controller settings and (b) Settings to give quarter amplitude response. (8)

19. (a) (i) Describe the function of an actuator. List the different types of actuators. (8)
- (ii) Explain the working principle of pneumatic spring actuator with valve positioner with a help of neat sketch. Mention the drawback of control valve without positioner. (8)

Or

- (b) (i) Explain the working of a simple current to pressure converter with neat diagram. (8)
- (ii) Explain the working principle of pneumatic actuated control valve with positioner with the help of neat diagram. (8)
20. (a) Discuss the significance of three element control strategy in boiler drum level and illustrate how it can eliminate the Shrink/ Swell and feed water pressure variation effects. Explain with a help of neat P and I Diagram. (16)

Or

- (b) With suitable example explain the concept of ratio and split-range control. (16)
-