Register Number: .....

B.E. DEGREE EXAMINATIONS NOV / DEC 2009

Fifth Semester

MECHATRONICS ENGINEERING

U07MH503 Instrumentation and Control System

Time: Three Hours **Maximum marks: 100**

Answer ALL Questions:-

PART A (10 x 1=10 Marks)

1. The difference between the indicated value and the true value of a quantity is known as

   A. Gross error B. Absolute error C. Dynamic error D. Relative error

2. In a critically damped system, the damping factor is of the order of:

   A. Zero B. less than unity C. unity D. greater than unity

3. Bimetallic metal is

   A. platinum B. Invar C. cromel D. alumel

4. Radiation pyrometer obeys

   A. Seeback effect B. Peltiar effect

   C. immersion effect D. stfen-boltzman law

5. Reynolds number -

   A. increases with increase in average velocity of liquid

   B. decreases with increase in absolute viscosity of liquid

   C. increases with increase in density of flowing liquid

   D. all of the above

6. The performance of capacitance level indicator is severely affected drift, because they change the

   A. area of the plate B. distance between two plates

   C. dielectric constant D. charge

7. Differential transformer transducer is used for measurement of

   A. pressure B. displacement C. liquid level D. temperature

8. strain gauge is used for converting mechanical displacement into a change in :

   A. inertance B. capacitance C. resistance D. inductance

9. Anticipatory control is

   A. Derivative control B. Integral control C. PI Control D. PID control

10. Pneumatic control mode implementation of

    A. flapper/nozzle system B. appropriate bellows

    C. variable flow restriction D. all of the above

PART B (10 x 2 = 20 Marks)

11. Define rangeability.
12. A second order system has a damping ratio of 0.6 and natural frequency of oscillation is 10 rad/sec. Determine the damped frequency of oscillation.
13. Define peltier effect.
14. Write down the disadvantages of Thermister.
15. Describe turbulent flow.
16. Define static pressure.
17. Define Young's Modulus.
18. Define piezo electric effect
19. What is the effect of PI controller on the system performance?
20. Explain the role of PWM for the control of a motor speed.

PART C (5 x 14 = 70 Marks)

21. a. Derive the expressions and plot the responses of a first order system for Step and Sinusoidal input.

(OR)

b. Explain the dynamic characteristics and analysis of measurement systems. (14)

22. a. Discuss in detail about construction and working of bimetallic thermometers with neat sketch. Also derive an expression for its radius of curvature. (14).

(OR)

b. i. Explain the working principle of PT100 with neat sketch. (7)

ii. Explain with neat sketch of Total radiation pyrometer. (7)

23. a. i. Explain the calibration of pressure gauge using Dead weight tester. (7)

ii. Explain with neat sketch of a flow meter which measures the flow velocity. (7)

(OR)

b. i. Explain the working principle Mclead gauge with neat sketch. (7)

ii. Explain in detail about capacitance type level measurement. (7)

24. a. i. What is optical encoder? Explain how it can be used to measure the speed. (7)

ii. Explain with neat sketch of bonded type strain gauge. (7)

(OR)

b. What are Load Cells? Explain the construction and working of any two types of Load cell with necessary diagrams. How do they differ in operation aspects? (14)

25. a. Explain in detail about the principle and operation of Pneumatic two step controller with neat sketch. Also list out the areas of its applications (14)

(OR)

b. Draw the OP AMP circuit of an electronic PID controller with the gain of K_p=2, K_I=1000 & K_D=0.001 and explain the operation. (14)

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