KUMARAGURU college of technology
character is life

Register Number: ……..

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulations 2009)

Fifth Semester

MECHATRONICS ENGINEERING

MCT107 : Process Control and Instrumentation

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A second order system would be critically damped when
   a) Damping ratio is less than 1 b) Damping ratio is equal to 1
   c) Damping ratio is greater than 1 d) Oscillatory
2. Dynamic quantities
   a) Vary rapidly with time b) Remain constant over a period of time
   c) Are displaced from zero position d) Vary exponentially
3. Which of the following units are employed where it is not possible to have physical contact with the system whose temperature is to be measured
   a) Thermocouples b) Resistance thermometers
   c) Radiation pyrometers d) Filled thermometers
4. The LVDT is an inductive transducer which functions due to
   a) Change in air gap b) Change in the amount of core material
   c) Mutual inductance d) Variation in the position of the core
5. The principle of Pirani gauge is based on
   a) Humidity of the medium b) Thermal conductivity of the medium
   c) Combustability of the medium d) None of these
6. The hot wire Anemometer is used to measure
   a) re in gases b) Gas velocities
   c) Liquid discharges d) Wind velocities at airports
7. The integral control
   a) Increases the steady state error b) Decreases the steady state error
   c) Increases the noise and stability d) Decreases the damping coefficient

8. If proportional band(PB) of a P controller is very wide then the system response is

a) Sluggish b) Perfect tracking

c) Unstable d) Very fast

9. Which of the following element is not used in an automatic control system?

a) Sensor b) Error detector

c) Oscillator d) Final control element

10. Which of the following statement is not an advantage of pneumatic control system as compared to electronic control system?

a) They are reliable b) They require less maintenance

c) They are free from fire hazards d) They are cost effective

PART B (10 x 2 = 20 Marks)

11. What is meant by order of the system?
12. Differentiate Accuracy and Precision.
13. State Bimetallic principle.
14. How change in temperature affects the resistance in Thermistor and RTD?
15. What is a Load Cell?
16. Define Differential pressure.
17. Under what circumstances a PID controller is preferred for controlling a process.
18. When is inferential control preferred?
19. Draw the block diagram of a feedback control system.
20. Write the transfer function of a P controller.

PART C (5 x 14 = 70 Marks)

21. a) (i) What is the difference between Active and Passive sensors? Give some example. (4)

(ii) Derive the expression for first order Mechatronics system response for step input and plot the response. Also discuss the effect of damping factor. (10)

(OR)

b) (i) Explain generalized measurement system with block diagram. (10)

(ii) Write short notes on Errors in measurement. (4)

22. a) (i) What is the need for cold junction compensation in thermocouples and explain the two methods of compensation. (7)

(ii) With a neat sketch, explain the principle and operation of Total Radiation Pyrometer. (7)

(OR)

b) (i) Explain the displacement measurement using LVDT with proper circuit and block diagram. (11)

(ii) Mention the applications of LVDT. (3)

23. a) (i) List the advantages and limitations of Manometer. (4)

(ii) With a neat sketch, explain in detail about the construction and working of Bourdon Tube pressure gauge. (10)

(OR)

b) Describe about Pitot tube and Turbine flow meter and mention their use in measurement of Flow.

24. a) (i) Describe split range control. Under what circumstances is it recommended? (7)

(ii) Write short notes on cascade control. (7)

(OR)

b) Enumerate the characteristics of P, I & D control modes with relevant graphs.

25. a) Draw the OP AMP circuit of a pneumatic PID controller and explain the operation.

(OR)

b) (i) What do you mean by Actuators? Mention its types. (4)

(ii) Explain the construction and operation of permanent magnet Stepper Motor with necessary diagrams. (10)

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