KUMARAGURU
college of technology
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Register Number: ……

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Third Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U13EIT302: Sensors and Transducers

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The measure of repeatability of a measurement of some quantity is

   a) Error b) Accuracy

   c) Precision d) Significant

2. In a permanent magnet moving coil ammeter, the deflection of pointer is proportional to product of flux density of magnetic field produced by the permanent magnet and the current in the moving coil. If the strength of the permanent magnet becomes 95% of the original, the meter gives erroneous resulting in error. This error is classified as ----------

3. For a second order system, the settling time for ±2% band is

   a) $\frac{3}{\xi\omega_n}$ b) $\frac{5}{\xi\omega_0}$

   c) $\frac{4}{\xi\omega_n}$ d) $2\xi\omega_n$

4. Ina second order system, the frequency of damped oscillations is 18 rad/s. The value of damping factor is 0.866. The natural frequency of oscillations is ------- rad/s

5. A thermistor exhibits

   a) only negative change of resistance with increase in temperature b) positive change of resistance with increase in temperature

   c) either positive or negative change of resistance with increase in temperature depending on type of material used d) None of the above

6. Two strain gauges are used to measure strain in a cantilever. One gauge is mounted on top of the cantilever and the other is placed at the bottom. The two strain gauges form two arms of a voltage sensitive wheat stone bridge. This bridge configuration is called as ---------

7. Capacitive transducers are normally used for

a) static measurements b) Dynamic measurements

c) both static and dynamic measurements d) transient measurements

8. Capacitive transducers can be used for measurement of liquid level. The principle of operation used in this case is change of ----------

9. A tachometer encoder can be used for measurement of displacement

a) In both the directions b) In one direction only

c) Its output pulses are counted only for the forward direction d) Its output pulses are counted only for the reverse direction

10. Mention the natural group of piezoelectric materials.

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. Justify the need for calibration.
12. Differentiate between active and passive transducers.
13. Define transfer function
14. Define rise time and peak time.
15. Platinum is used as primary element in all high accuracy resistance thermometers. Justify.
16. Define gauge factor.
17. Sketch the frequency response of capacitive transducers.
18. State the working principle of EI pick up transducer.
19. What is villari effect?
20. What is a smart sensor?

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. Illustrate in detail the construction and working principle of LVDT with neat diagrams. Also list its advantages and disadvantages.

22. a) (i) What are the basic blocks of a generalized instrumentation system? Draw the various blocks and explain their functions with a suitable example. (10)

(ii) Define the term calibration & What is the need for calibration. (4)

(OR)

b) (i) Discuss in detail the various classifications of errors with examples. Also discuss the methods of minimizing them. (8)

(ii) A set of independent ten measurements were made to determine the weight of a lead shot. The weight in grams were: (6)

1.570,1.597,1.501,1.562,1.577,1.580,1.564,1.586,1.550,1.575.

Calculate (1)arithmetic mean (2) average deviation (3) standard deviation (4)variance (5)probable error of one reading (6)probable error of mean

23. a) (i) Derive the expressions for magnitude and phase of a first order system when subjected to a sinusoidal input signal. Draw the magnitude and phase versus frequency plots. (7)

(ii) Derive the equations for time response of a first order system when subjected to unit ramp input. Draw the response curves and find the steady state error. (7)

(OR)

b) Describe the static and dynamic characteristics of an instrument

24. a) Explain the construction and working of hot wire anemometer in its two modes of operation with neat diagrams.

(OR)

b) Describe the construction and working of Resistance Potentiometers and also derive the expression for the error occurring in a resistance potentiometer when connected across a load of finite resistance.

25. a) Write short notes on (i) Hall effect transducer.(ii)Fiber optic transducer

(OR)

b) Describe the different modes of operation of piezoelectric transducers. Derive the expressions for voltage and charge sensitivities.

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