B.E. DEGREE EXAMINATIONS: APRIL/MAY 2009

Fourth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U07EI 401 Transducer Engineering

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

Answer ALL the Questions:-

PART A (20 x 1 = 20 Marks)

1. The errors caused by the happening or disturbances about which we are unaware are lumped together are called

    A. Systematic Error   B. Gross Error   C. Observational Error   D. Residential error

2. The standards maintained by National standards laboratories in different part of the world are called

    A. Primary standard   B. Secondary Standard

    C. Working Standard   D. International Standard

3. One of the following can act as an inverse transducer

    A. Strain Gauge   B. Selsyn

    C. Capacitive transducer   D. Piezoelectric transducer

4. While selecting transducer for a particular application

    A. Only the input characteristics should be considered

    B. Only the output characteristics should be considered

    C. Only the transfer characteristics should be considered

    D. Input, Output characteristics should be considered

5. A thermometer is calibrated 150°c to 200°c. The accuracy is specified within ± 0.25 % of instrument span. The maximum static error is

    A. ± 0.2°c   B. ± 0.125°c   C. ± 0.250°c   D. ± 0.15°c

6. Closeness with which a given input may be measured over and over again is called

    A. Accuracy   B. Sensitivity   C. Repeatability   D. Drift

7. In the centre zero analog ammeter having a range of -10A to +10 A, there is a detectable change of pointer from its zero position on either sides of the scale only if the current reaches a value of 1A on either side. The ammeter has a

    A. Resolution of 1A   B. Dead zone of 1A

    C. Dead Zone of 2A   D. Sensitivity of 1A

8. The first order system has a time constant of 20 s. It is subjected to a step input. The settling time of the output is assumed to be the time it reaches 95% of its final steady state value. The settling time of the system is

    A. 100s   B. 60 s   C.20 s   D. Infinity

9. In a resistance potentiometer the non Linearity

    A. Increases with increase of load to potentiometer resistance

    B. Decreases with increase of load to potentiometer resistance

    C. Is not dependent upon load to potentiometer resistance

    D. Increases with decrease of load to potentiometer resistance

10. Which one of the following is not correct in connection with the thermistor

    A. Its resistance decreases with increases of temperature

    B. It is generally composed of semiconductor material

    C. It has highly linear characteristics

    D. It has high sensitivity

11. In a wire wound strain gauges ,the change in resistance on application of strain is mainly due to

    A. Change in length of wire   B. Change in diameter of wire.

    C. Change in both length and diameter of the wire   D. Change in resistivity

12. A platinum thermometer has a resistance of 100Ω at 25 ° C. The resistance at 65 °C is

    A. 115.68 Ω B. 151.8 Ω C.105.73Ω D.125.48Ω

13. Capacitive transducers are normally used for

    A. Static measurements   B. Dynamic measurements

    C. Dynamic and static measurements   D. Transient measurements

14. The residual voltage in LVDT is

    A. Due to the variation in the position of the core

    B. Due to the variation of the electrostatic discharge

    C. Due to the stray magnetic field and temperature effects

    D. Cannot be made negligible with the AC source

15. Dynamic characteristics of capacitive transducers are similar to those of

    A. Low pass filter   B. High pass filter   C. Notch filter   D. Band stop filter

16. When a synchro transmitter, synchro control transformer pair is used as an error detector the output voltage obtained from the rotor terminal of the synchro transformer is

    A. Sinusoidal   B. Half wave rectified

    C. Suppressed carrier modulated   D. Amplitude modulated

electric transducers are

Passive transducers   B. Active transducers

C. Inverse transducers   D. (C) and (B)

piezo electrical transducer has an output voltage of 6V at no load conditions. It has a capacitance 250 pF. It is connected to load capacitance 0f 125 pF.. The voltage across the load high frequency is

A. 2V   B. 4V   C.3 V   D.9 V

A tachometer encoder can be used for measurement of displacement

A. In one direction only

B. In both the directions

C. Its output pulses are counted only for forward direction

D. Its output pulses are counted only for reverse direction

20. Which is not a major type of fibre used commonly as a sensor

A.Mono mode   B. Multimode   C. Dual Mode   D. Birefringent

PART B (5 x 16 = 80 Marks)

21. (a) (i) Describe in detail different errors in measurement system .   (10)

(ii) Explain the classifications of transducers   (6)

(OR)

21.(b) (i) Write the significance of odds and uncertainty   (6)

(ii) in a test temperature is measured 100 times with variations in apparatus and   (10)
procedures. After the corrections the results are

Temperature in ° C	397	398	399	400	401	402	403	404	405
Frequency of occurrence	1	3	12	23	37	16	4	2	2

Calculate   (1) Arithmetic mean   (2) Mean Deviation

(3) standard deviation   (4) the standard deviation of the mean

22. (a) Explain the following static characteristics of transducers

(i)   Accuracy   (ii) Precision   (iii) Resolution (iv) Linearity   (16)

(OR)

22.(b) Obtain the model of a thermometer and find its step and the ramp response (16)

23. (a) (i) Explain the construction and working principle of resistance potentiometer (6)

(ii) Derive the expression for the error occurring in a resistance potentiometer when it is connected across a finite load resistance .Obtain the condition for maximum error (10)

(OR)

23.(b) Write short notes on

(i) Hot wire Anemometer (8)

(ii) Humidity Sensor (8)

24.(a) Explain the working of

(i) Induction potentiometer (8)

(ii) Variable reluctance transducer (8)

(OR)

24.(b) Explain the working principle of capacitive transducer. Derive the transfer function and obtain its frequency response (16)

25.(a) (i)With neat sketch the different mode of operation of piezoelectric crystal (6)

(ii) Derive an expression for voltage sensitivity and charge sensitivity of piezoelectric crystal (10)

(OR)

25.(b) (i) Explain the working principle of magnetostrictive with neat diagram and list out its applications (8)

(ii) Explain the digital transducer for the measurement of displacement (8)

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