Code No: 07A41001 **R07** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
SENSORS AND SIGNAL CONDITIONING
Electronics And Instrumentation Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Explain the static characteristics of measurement system. [16]

2. Derive the expression for current in the meter connected across the output terminals of a Whet stone bridge when it is slightly unbalanced. [16]

3. (a) Explain the operation of Electrometer amplifier
   (b) Define noise. How an op-amp is affected by noise? How it can be reduced [8+8]

4. What are the merits of magneto-strictive transducer? Name two materials commonly employed for these. Outline the constructional features and principles of working of this transducer for the measurement of force. [16]

5. (a) Mention the types of flow meter and write importance in industry and also write applications and differences .
   (b) Calculate the NEP for a photodiode biased so that I_D = 10 nA. R_p = 100 MΩ, S = 0.5 A/W, when operating at 45^0C and the noise bandwidth is from 10 kHz to 100 kH. [8+8]

6. (a) How carrier amplifiers are classified? Explain any one of them.
   (b) Why the carrier amplifier is required for all the sensors. Explain in detail with one example. [8+8]

7. A resistance strain gauge is used to measure stress on steel. The steel stressed to 1200 kgf/cm^2. Assume Youngs Modulus of steel 2×10^6 kgf/cm^2. Determine the pressure gauge of resistance of a strain gauge. Assuming gauge factor equal to 2.5. [16]

8. (a) Derive the expression for impulse response of piezoelectric transducers.
   (b) Sketch the response curves. [10+6]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A41001 **R07** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
SENSORS AND SIGNAL CONDITIONING
Electronics And Instrumentation Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Write short notes on Magneto transistors.
   (b) Explain about the resonant sensors. [8+8]

2. The wire in a strain gauge is 0.1m long and has a initial resistance of 120 Ω. On the application of force, the wire length increases by 0.1mm and resistance increases by 0.21 Ω. Determine the gauge factor of the device. [16]

3. In a second order system, the peak overshoot is 100%, calculate the value of damping factor. [16]

4. Explain the following terms in connection with the operational amplifier:
   (a) Input offset voltage
   (b) Input offset current
   (c) Bias current
   (d) Slew rate. [16]

5. (a) A mercury thermometer has a capillary tube of 03mm diameter. If the bulb is made of zero expansion material. What volume must it have of a sensitivity of 3mm/^{0}C is desired? Assuming operating temperature to be 20 ^{0}C & coefficient of volumetric expansion of mercury is 0.181×10^{-3}.
   (b) Explain the factors affecting the static accuracy of filled in thermometers.[8+8]

6. (a) How the resolver to digital converters are based on Sine & Cosine multipliers? Explain in detail.
   (b) Write the importance of resolver converters in analog & digital. [10+6]

7. (a) Estimate the IZE, gain error, and drifts of a noninverting amplifier intended for a sensor whose output resistance is 1KΩ when implemented by the OP77GP with R_1= 100Ω , R_2 = 100kΩ(metal film , 1% tolerance, TCR = ±50 x $10^{-6}/^oC$), the ambient temperature is 40^{o}C, and the power supplies (+15V,-15V) have a maximal ±1%ripple
   (b) How the instrumentation amplifier is effected with noise. [8+8]

8. An LVDT is employed for measuring the deflection of bellows. The sensitivity of the LVDT is 60V/mm. The bellows is deflected by 0.15mm by a pressure of 1.2×10^6 N/m^2. Determine the sensitivity of the LVDT in V per N/m^2 and the pressure when output voltage is 4.5V. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A41001 **R07** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
SENSORS AND SIGNAL CONDITIONING
Electronics And Instrumentation Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Describe the advantages of differential amplifier with respect to noise immunity and drift immunity. [16]
2. Explain in detail about AC amplifiers & power supply decoupling in AC bridges. [16]
3. (a) Write principle and operation of Incremental position encoder
   (b) Write its applications in industry [10+6]
4. Explain the phenomena of Hysterisis in measurement system. Explain the terms "Threshold", "Maximum input Hysterisis", "Maximum output Hysterisis", with neat diagrams. [16]
5. A semiconductor strain gauge having a resistance of 1000 Ω and gauge factor of 133 is subjected to a compressive strain of 500 microstrain. calculate new resistance of the gauge. [16]
6. (a) Derive the expression for magnitude of voltage across the load by making simplifying assumptions.
   (b) Prove that at medium & high frequencies, the magnitude of the voltage across the load is independent of frequency. [8+8]
7. (a) Explain in detail about the noise in amplifiers
   (b) Explain in detail effect of Noise in op- amp. [8+8]
8. What is a Hall effect? Why its more pronounced in semiconductors than in metals? Describe working principle, construction and applications of hall effect transducers. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: 07A41001 **R07** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
SENSORS AND SIGNAL CONDITIONING
Electronics And Instrumentation Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Explain the principle and operation of Ultrasonic based sensors. [16]
2. (a) What are the specific signal conditions for capacitive sensors?
   (b) How phase - sensitive demodulation for LVDT is based on a half - wave rectifier & full-wave rectifier? [8+8]
3. (a) How the frequency response limitation of chopper amplifier is overcome?
   (b) With a neat block diagram explain the operation of chopper amplifier. [8+8]
4. Give an overview of the inductive transducers explaining their principle of operation like variation of number of turns, geometric configurates and permeability. [16]
5. Derive an expression for the closed loop gain of an operational amplifier used in the non-inverting mode. Describe the assumptions made. [16]
6. Describe the construction and working of Resistance thermometer. Describe the materials used for RTD's along with their properties. Sketch their typical characteristics. [16]
7. Explain the principle of working and applications of optical pyrometers. [16]
8. The true value of a Voltage across Resister is 50V. the measurement finds a value 49V. Calculate:
   (a) The absolute error
   (b) The percentage error
   (c) The percentage accuracy. [16]

⋆ ⋆ ⋆ ⋆ ⋆