

Code No: NR/RR221002

NR/RR

Set No. 2

II B.Tech II Semester Examinations, December 2010

TRANSDUCERS IN INSTRUMENTATION

Common to Electronics And Control Engineering, Electronics And
Instrumentation Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Draw the block diagram of the generalized feedback system of a Force-balance transducer and explain its each block.
(b) Explain the dynamic response of Force-balance transducers to sinusoidal excitation with respect to sensitivity and phase angle. [8+8]
2. (a) Describe the constructional features of a linear variable differential transformer and comments on its merit in comparison to a push pull self inductive transducer.
(b) Discuss the factors limiting the bandwidth and sensitivity of a linear variable differential transformer. [8+8]
3. A parallel plate capacitive transducer uses plates of area 500 mm^2 which are separated by a distance of 0.2 mm . Calculate the value of capacitance when the dielectric is air having a permittivity of $8.85 \times 10^{-12} \text{ f/m}$.
(a) Calculate the change in capacitance if a linear displacement reduces the distance between the plates to 0.18 mm . Also calculate the ratio of per unit change of capacitance to per unit change of displacement.
(b) Suppose a mica sheet 0.01 mm thick is inserted in the gap. Calculate the value of original capacitance and change in capacitance for the same displacement. Also calculate the ratio of per unit change in capacitance to per unit change in displacement. The dielectric constant of mica is 8. [16]
4. (a) Write short notes on compensating leads in thermocouple.
(b) List out advantages and disadvantages of thermocouple. [8+8]
5. (a) Classify various transducers and give an example of each and mention their applications.
(b) What is the true value of voltage across the $500 \text{ K}\Omega$ resistor connected between terminals A and B as shown in figure 6b. What would a voltmeter with a sensitivity of $20 \text{ K}\Omega/\text{v}$ read on the following ranges: 50, 15, 5 volts when connected across terminals C and D. [8+8]

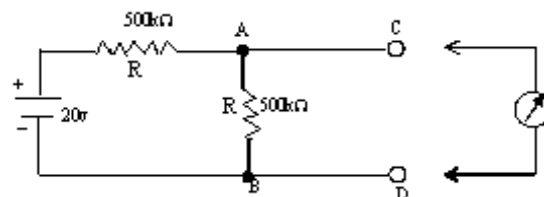


Figure 6b

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6. (a) Derive the expression for magnitude and phase of a first order system when subjected to a sinusoidal input signal. Draw the magnitude and phase versus frequency plots.
- (b) A first order instrument which has a time constant of 0.5 sec. is subjected to an input of $2 \sin 3t + 5 \sin 30t$ find the response of the instrument. [8+8]
7. Explain clearly the concept of loading effects and frequency response of piezo electric transducer. [16]
8. (a) Explain the principle of working and applications of photo transistors.
- (b) Explain why they are preferred for digital applications. [10+6]

FIRSTRANKER

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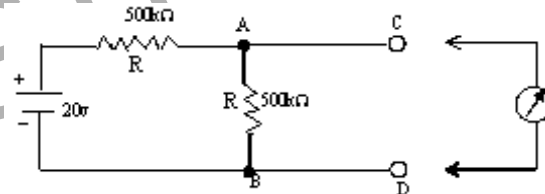


Figure 6b

3. (a) Explain the principle of working and applications of photo transistors.
- (b) Explain why they are preferred for digital applications. [10+6]
4. A parallel plate capacitive transducer uses plates of area 500 mm^2 which are separated by a distance of 0.2 mm . Calculate the value of capacitance when the dielectric is air having a permittivity of $8.85 \times 10^{-12} \text{ f/m}$.
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 - (b) Suppose a mica sheet 0.01 mm thick is inserted in the gap. Calculate the value of original capacitance and change in capacitance for the same displacement. Also calculate the ratio of per unit change in capacitance to per unit change in displacement. The dielectric constant of mica is 8. [16]
5. (a) Draw the block diagram of the generalized feedback system of a Force-balance transducer and explain its each block.

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- (b) Explain the dynamic response of Force-balance transducers to sinusoidal excitation with respect to sensitivity and phase angle. [8+8]
6. Explain clearly the concept of loading effects and frequency response of piezo electric transducer. [16]
7. (a) Write short notes on compensating leads in thermocouple.
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8. (a) Describe the constructional features of a linear variable differential transformer and comments on its merit in comparison to a push pull self inductive transducer.
(b) Discuss the factors limiting the bandwidth and sensitivity of a linear variable differential transformer. [8+8]

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8. (a) Classify various transducers and give an example of each and mention their applications.
- (b) What is the true value of voltage across the $500\text{ K}\Omega$ resistor connected between terminals A and B as shown in figure 6b. What would a voltmeter with a sensitivity of $20\text{ K}\Omega/\text{V}$ read on the following ranges: 50, 15,5 volts when connected across terminals C and D. [8+8]

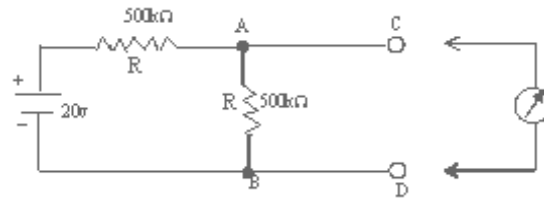


Figure 6b

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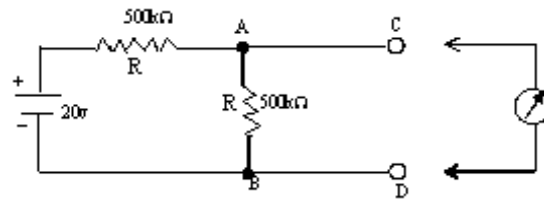


Figure 6b

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