Code No: RR212203 **Set No. 1**

II B.Tech I Semester Supplementary Examinations, November 2006
TRANSDUCERS AND INSTRUMENTATION COMPONENTS
(Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the following static characteristics with necessary examples and graphs:
   i. Accuracy
   ii. sensitivity
   iii. static error
   iv. Dead space
   v. Drift. [10M]
   (b) A voltage has a true value of 1.50 volts. An Analog indicating instrument with a scale range of 0-2.50 volts shows a voltage of 1.46 volts. What are the values of absolute error and correction. Express the error as a traction of the true value and the full-scale deflection. [6M]

2. (a) What is a thermistor? How is it used for temperature measurement, for various applications? [8M]
   (b) The temperature of an oven is raised at the rate of 200^oC per hour. For the condition that the indicating instrument must not show an error more than 5^0C what is the maximum permissible time constant? [6M]
   (c) What are the limitations of thermistor? [2M]

3. (a) In a variable capacitance transducer the diaphragms are 20mm in diameter and 4mm apart. If a pressure produces and average deflection of 0.25mm, calculate the value of capacitance after the application of force. The capacitance before application of force is 400pf. [8M]
   (b) Discuss the scheme of a variable permittivity of thickness dielectric type sensor. [8M]

4. (a) Give a brief account of a temperature transducer. [6M]
   (b) A platinum resistance thermometer has a resistance of 40Ω what is the resistance when the temperature is 200^oC? When the thermometer has a resistance of 40Ω, what is the value of temperature? The resistance temperature coefficient of platinum is $0.0039/\ ^oC$. [10M]

5. Write short notes on: [16M]
   (a) material used for belt drives
   (b) select a belt drive
   (c) uses of belt drive.

6. (a) Discriminates between properties and interval and differential control as applied to control systems. [8M]
   (b) Explain the working principles of derivative and integral action of pneumatic controller. [8M]
7. (a) Express a relationship between various voltages of a synchro transmitter.[8M]
   (b) How are synchros useful in error detection and correction in a servo control system. [8M]
8. (a) Discriminate between ordinary electric motors and Servo motors. [4M]
   (b) Briefly explain the working of D.C and A.C servomotors with neat sketches. [12M]

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Code No: RR212203 **Set No. 2**

II B.Tech I Semester Supplementary Examinations, November 2006
TRANSDUCERS AND INSTRUMENTATION COMPONENTS
(Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the following static characteristics with necessary examples and graphs:
   i. Accuracy
   ii. sensitivity
   iii. static error
   iv. Dead space
   v. Drift. [10M]
   (b) A voltage has a true value of 1.50 volts. An Analog indicating instrument with a scale range of 0-2.50 volts shows a voltage of 1.46 volts. What are the values of absolute error and correction. Express the error as a traction of the true value and the full-scale deflection. [6M]

2. (a) What is a thermistor? How is it used for temperature measurement, for various applications? [8M]
   (b) The temperature of an oven is raised at the rate of 200^oC per hour. For the condition that the indicating instrument must not show an error more than 5^0C what is the maximum permissible time constant? [6M]
   (c) What are the limitations of thermistor? [2M]

3. (a) How is angular displacement measured using capacitive transducer. [8M]
   (b) How is the rotational displacement measured by using capacitive transducer. [8M]

4. (a) Explain briefly the methods used to measure the output from thermocouples. [8M]
   (b) A chromel-alumel thermocouple having a linear relationship between temperature and emf indicates zero at 0^oC and 45.14 mV at 1100^oC. The thermocouple is exposed to a temperature of 840^oC with cold junction maintained at 25^oC, calculate the indicated emf. [8M]

5. Write short notes on: [16M]
   (a) Flat pivot
   (b) Flat collar pivot
   (c) Conical pivot.

6. (a) What do you understand by pneumatic indicators? [6M]
   (b) Briefly explain the construction and working details of pneumatic indicator. [10M]

7. (a) If an additional winding in which DC flows will there be any change in the operation of a transformer-Explain. [6M]
   (b) Explain the operation of a series connected magnetic amplifier with necessary circuit diagram and waveform. [10M]

8. A stepper motor driven by bipolar drive circuit has the following parameters. [16M]

   Winding inductance (average) = 30mH

   Rated current = 5A

   Total resistance in each phase = 15 ohms

   D.C supply = 45V

   When transistors are turned off, determine the

   (a) Time taken by the phase current to decay to zero.
   (b) Proportion of the stored inductive energy returned to the d.c supply.

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Code No: RR212203 **Set No. 3**

II B.Tech I Semester Supplementary Examinations, November 2006
TRANSDUCERS AND INSTRUMENTATION COMPONENTS
(Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the following static characteristics with necessary examples and graphs:
   i. Accuracy
   ii. sensitivity
   iii. static error
   iv. Dead space
   v. Drift. [10M]
   (b) A voltage has a true value of 1.50 volts. An Analog indicating instrument with a scale range of 0-2.50 volts shows a voltage of 1.46 volts. What are the values of absolute error and correction. Express the error as a traction of the true value and the full-scale deflection. [6M]
2. (a) What are the different types of anemometers available? Explain their principle of operation.
   (b) Explain the constructional features of RTD.
3. (a) Mention the features of piezo electric accelerometers. [8M]
   (b) How will you measure vibration using piezo electric pickup. [8M]
4. Explain the principle of working of thermocouples. State the law of intermediate temperature and intermediate metals for thermocouples. [16M]
5. (a) What is velocity rates as applied to belt drives. [4M]
   (b) Derive the expression for velocity rate of belt drive. [8M]
   (c) Explain the effect of slip on the performance of the belt drive. [4M]
6. (a) What do you understand by blow down and chatter of safety relief value. Explain. [8M]
   (b) What is the need for value tightness and leakage proof in safety relief value. [8M]
7. (a) How can a potentiometer be used as a data acquisition component?
   (b) Categorize the different types of potentiometer useful for specific applications.
   (c) Explain the salient characteristics of potentiometer.
8. (a) How can a stepper motor be used in numerical control of m/a - explain. [6M]

(b) Draw the diagram of a variable inductance stepper motor and explain its working. [10M]

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Code No: RR212203 **Set No. 4**

II B.Tech I Semester Supplementary Examinations, November 2006
TRANSDUCERS AND INSTRUMENTATION COMPONENTS
(Instrumentation & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Classify various transducers and give an example of each and mention their applications. [8M]
   (b) What is the true value of voltage across the 500 KΩ resistor connected between terminals A and B as shown in (figure1) below ? What would a voltmeter with a sensitivity of 20 KΩ/v read on the following ranges: 50, 15,5 volts when connected across terminals C and D. [8M]

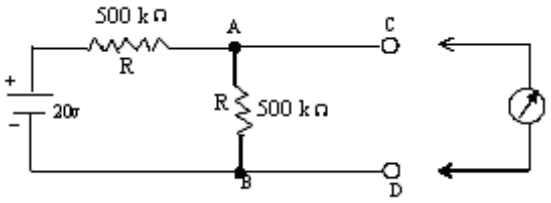

Figure 1

2. (a) Define gauge factor G_f for an electrical strain gauge. Compare the characteristics of metallic and semi conductor type strain gauges. [8M]
   (b) Explain with the aid of a circuit diagram the principle of operation of a strain measurement system with temperature compensation technique. [8M]

3. Describe clearly the principle of constructing a capacitive transducer using
   (a) Cantilever spring plate. [8M]
   (b) Quartz diaphragms. [8M]

4. Describe the construction and working of bimetallic thermometers. Derive the expression for radius of curvature when the bimetallic element is used as a cantilever. [16M]

5. (a) What is the coupling mechanism with operation of a cluch in an automotive?
   (b) In what way are different from chain and belt drives?
   (c) Enumerate the applications of friction drives.

6. (a) With a neat diagram explain the construction and working of metallic Bellows? [10M]
   (b) Explain how it affects the controller performance. [6M]

7. (a) Express a relationship between various voltages of a synchro transmitter.[8M]
   (b) How are synchros useful in error detection and correction in a servo control system. [8M]

8. (a) Sketch the block diagram of a servo system using two phase motor and derive its transter function.
   (b) What will be the response of the system for step input.

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