Code No: R05320204 **Set No. 1**

III B.Tech II Semester Regular Examinations, Apr/May 2008
INSTRUMENTATION
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) How the performance characteristics of an instrument are classified?
   (b) Explain clearly the difference between Accuracy and Precision? [8+8]
2. Describe the process of modulation and the techniques usually adopted. [16]
3. Discuss in detail, electrostatic deflection of the electron beam. [16]
4. What are the different types of Digital voltmeters? Explain them briefly with neat sketches. [16]
5. (a) Explain the principle and working of true RMS voltmeter with a block diagram.
   (b) What are the differences between peak reading and RMS voltmeters. [10+6]
6. (a) Discuss the materials used for potentiometers.
   (b) A voltage dividing potentiometer is used to measure an angular displacement of 60^0 and the total angle travel of the potentiometer is 355^0. Calculate the voltage output on open circuit if the potentiometer is excited by a 60V source. Calculate the actual value of the output voltage at this setting if a voltmeter of 1MΩ resistance is connected across the output.The resistance of the potentiometer is 1KΩ. Calculate the % error. [6+10]
7. (a) What is a load cell. Explain its principle of operation.
   (b) A load cell consists of a solid cylinder of steel 40mm indiameter with four strain gauges bonded to it and connected into the four arms of voltage sensitive bridge. The gauges are mounted to have a Poisson's arrangement. If the gauges are each of 100 Ω resistance and gauge factor 2.1, the bridge excitation voltage 6V, determine the sensitivity of the cell in V/kN. Modulus of Elasticity of steel is $200GN/m^2$ and the poisson's ratio is 0.29. [8+8]
8. (a) Discuss in detail about turbine meters including their advantages and limitations.
   (b) Describe pressure measurement Piezoelectric transducers with neat sketches. [10+6]

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Code No: R05320204 **Set No. 2**

III B.Tech II Semester Regular Examinations, Apr/May 2008
INSTRUMENTATION
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define 'drift', 'threshold value' and 'dead-band' of a measuring system and give an example for each.
   (b) Distinguish between 'range' and 'span' of an instrument. [8+8]

2. (a) Explain the spectra of a periodic rectangular pulse train for the following.
   i) Amplitude
   (ii) Phase spectra when time origin coincides with centre of pulse.
   iii) Phase spectra with pulse starting at t=0.
   (b) Define line spectra. [8+8]

3. Define deflection sensitivity and deflection factor of a cathode ray tube. [16]

4. On what basis digital voltmeters are classified and explain any two non-integrating type digital voltmeters. [16]

5. (a) Mention a few applications of heterodyne wave analyzers.
   (b) Explain the principle and operation of basic spectrum analyzer with a neat block diagram. [4+12]

6. Explain the operation of Control type synchro system. [16]

7. (a) Explain the operation of DC Tachometer generators. What are it's advantages and disadvantages.
   (b) Explain Strobotran with a neat sketch. [8+8]

8. Write a short notes on the following:
   (a) Electromagnetic flow meter
   (b) Inductive method of liquid level measurement
   (c) thermocouples. [6+5+5]

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Code No: R05320204 **Set No. 3**

III B.Tech II Semester Regular Examinations, Apr/May 2008
INSTRUMENTATION
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is meant by stability of a measuring system ? Indicate which class of instruments are required to be more stable.
   (b) Distinguish between 'static' and 'dynamic' characteristics of a measuring system and state the relevance of each in a measuring process. [8+8]

2. Explain how angle modulation of a signal is done. Distinguish between angle and Phasemodulation. [16]

3. (a) Write the important specifications of CRO for instrumentation applications. What selection factors are necessary for selecting a CRO.
   (b) Calculate the velocity of an electron beam in an oscilloscope if the voltage applied to its vertical deflection plates is 2000v. Also calculate the cut off frequency if the maximum transit time is 1/4th of a cycle. The length of horizontal plates is 50mm. [8+8]

4. With a neat block diagram explain the microprocessor based ramp type digital voltmeter. [16]

5. (a) Explain the principle and working of peak reading voltmeter with a neat block diagram.
   (b) A coil of unknown impedance is connected in series with a capacitor of 224μF and an ammeter of negligible impedance is connected to a variable frequency of constant voltage and negligible impedance. The frequency was adjusted both above and below the resonance frequency till the reading of the ammeter was reduced to 70.7% of its value at resonance. This occurred at the frequencies of 876 and 892 kHz. Determine effective resistance, inductance and Q of the coil. [10+6]

6. Explain the factors that influence the selection of a transducer. [16]

7. (a) Define gauge sensitivity and derive expression for it.
   (b) in order to measure strain in a cantilever beam a single strain gauge of resistance 1 K Ω and gauge factor 2 and temperature coefficient of $10 \times 10^{-6}/{}^{0}$C is mounted on one beam and connected in one arm of the bridge circuit. The other three arms of the bridge have resistances of 100 Ω each. The bridge detector resistance is 100 Ω and it's sensitivity is 10mm/μA
      i. Calculate deflector's defletion for 0.1% strain

ii. Calculate the change in effective strain indicated when the room temperature increases by 10 ^{0}C.

(c) Mention few devices that are used for the measurement of Rotary displacement. [4+9+3]

8. (a) Describe the principle and operation of Knudsen gauge with a neat sketch.

(b) Describe the operation of Ionization gauges for pressure measurement. [8+8]

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Code No: R05320204 **Set No. 4**

III B.Tech II Semester Regular Examinations, Apr/May 2008
INSTRUMENTATION
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Describe the various sources of errors encountered in a measuring system.
   (b) What do you understand by the terms
      i. Systematic errors
      ii. Instrumental errors. [8+8]

2. (a) Explain the common forms of periodic signals with their waveforms.
   (b) What is complex form representation of periodic signal? [8+8]

3. What is digital frequency meter? Explain its principle of operation, construction and working. [16]

4. (a) Explain in detail about integrating type DVM.
   (b) Explain the successive approximation conversion techniques. [8+8]

5. (a) Explain the working of a Frequency selective wave analyzer with a neat block diagram.
   (b) What is harmonic distortion? What are the types of the distortion? Discuss them. [8+8]

6. (a) Discuss the materials used for potentiometers.
   (b) A voltage dividing potentiometer is used to measure an angular displacement of 60^0 and the total angle travel of the potentiometer is 355^0. Calculate the voltage output on open circuit if the potentiometer is excited by a 60V source. Calculate the actual value of the output voltage at this setting if a voltmeter of 1MΩ resistance is connected across the output.The resistance of the potentiometer is 1KΩ. Calculate the % error. [6+10]

7. (a) Discuss in detail about strain gauge Rosettes.
   (b) The strain gauge having a gauge factor of 2 is connected in a bridge circuit having an excitation voltage 8V. The resistances are equal.It is subjected to a strain of 0.006. If this output is to represent $2/3^{rd}$ of full scale deflection of a recorder, **what should be the gain of the amplifier**. The full scale input voltage of the recorder is 1V. [10+6]

8. (a) Discuss about the radiation receiving elements used in Radiation pyrometers.

(b) The emitted radiant energy from a piece of metal measured and the temperature is found to be 1065 ^{0}C assuming surface emissivity of 0.82. It was later found that the true emissivity is 0.75. Calculate the error in the temperature measurement. [10+6]

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