Code No: V3209

R07

Set No: 1

III B.Tech. II Semester Supplementary Examinations, December - 2012
INSTRUMENTATION
(Electrical and Electronics Engineering)

Time: 3 Hours   **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
*****

1   a) Describe the static characteristics of an instrument?
     b) A multimeter having a sensitivity of 2000Ω/V is used for the measurement of
     voltage across a circuit having an output resistance of 10kΩ. The open circuit voltage
     of the circuit is 6 V. Find the reading of the multimeter when it is set to its 10V scale.
     Find the percentage error.   [8+8]

2   List the standard test signals? Explain each in detail?   [16]

3   a) Explain the principle of sampling oscilloscope with the help of block diagram?
     b) In the oscilloscope pattern shown in figure.1(a) and (b) the signal connected to the
     vertical plates has the same frequency in parts (a) and (b). If the input to the
     horizontal plates is a 50Hz voltage.
        (i)   State the unknown frequency and
        (ii)   Explain what causes the difference in appearance of two patterns.   [8+8]
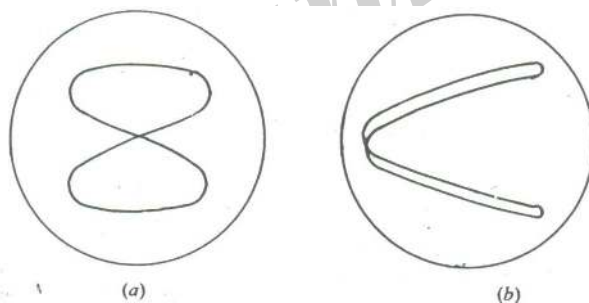

Figure.1

4   a) Describe the working of an integrating type digital voltmeter?
     b) State the advantages and disadvantages of ramp type DVM?   [8+8]

5   a) Describe the engineering applications of wave analyzers?
     b) Describe the circuits and working of wave analyzers used for audio frequency and
     megahertz ranges?   [8+8]

R07

Set No: 1

6   a) List out advantages of Electrical transducers?
b) A strain gauge has gauge factor of 4. If a strain gauge is attached to metal bar that stretches from 0.25 m to 0.255m when strained, what is the percentage change in resistance? If the unstrained value of gauge is 120Ω, what is the resistance value of gauge after application of strain?   [8+8]

7   a) Explain the measurement of torque using magnetostrictive method?
b) In order to measure strain in a cantilever beam, a single strain gauge of resistance 1kΩ and gauge factor 2 and a temperature co-efficient $10 \times 10^{-6}/^0C$ is mounted on the beam and connected in one arm of a bridge circuit. The other three arms of the bridge have a resistance of 100Ω each. The bridge detector resistance is 100Ω and its sensitivity is 10 mm/μA
(i) Calculate the detector deflection for 0.1 percent strain
(ii) Calculate the change in effective strain indicated when the room temperature increases by 10^0C [8+8]

8   Describe the methods of measurement of pressure using
      (a) Capacitive transducer
      (b) Photo electric transducer   [8+8]

*****

Code No: V3209

R07

Set No: 2

III B.Tech. II Semester Supplementary Examinations, December - 2012
INSTRUMENTATION
(Electrical and Electronics Engineering)

Time: 3 Hours   **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
*****

1 a) Explain the dynamic characteristics of an instrument?
   b) A multimeter having a sensitivity of 2000Ω/V is used for the measurement of voltage of a circuit having an output resistance of 1000Ω and an open circuit voltage of 6 V at its 10 V scale. Find the error in measurement.   [8+8]

2 a) Explain the common forms of aperiodic signals with their wave forms?
   b) What is complex form representation of aperiodic signal?   [8+8]

3 a) State the applications of cathode ray oscilloscope?
   b) An electrically deflected CRT has a final anode voltage of 2000V and parallel deflecting plates 1.5 cm long and 5 mm apart. If the screen is 50 cm from the centre of deflecting plates. Find (a) beam speed (b) the deflection sensitivity of the tube and (c) the deflection factor of the tube?   [8+8]

4 Draw and explain the circuit of a digital frequency meter. What are the different methods used for high frequency determination?   [16]

5 a) Explain the term total harmonic distortion. Describe the functioning of a total harmonic distortion meter?
   b) Write the principle of working of vector impedance meter with a neat sketch?
                                                                                 [8+8]

6 a) Write the characteristics and choice of transducers?
   b) An LVDT with a secondary voltage of 5V has a range of ±25mm (a) find the output voltage when the core is -18.75 mm for the centre (b) plot the output voltage versus core position for a core movement going from +18.75mm to -10mm. [8+8]

7 a) What is the gauge sensitivity? Explain with a neat sketch to find the sensitivity of a half bridge.
   b) Two electrical strain gauges are bonded to a duralumin cantilever and connected a bridge as adjacent arms. Each gauge has a resistance of 100Ω and a gauge factor of 2.1. the input voltage is 4V. The stress is 200MN/m^2. Find the current through the detector if its resistance is 400. Modulus of elasticity of duralumin is 70GN/m^2. [8+8]

8 a) Explain the principle of ionization type vacuum gauge.
   b) Explain the measurement of vacuum using pirani gauge.   [8+8]
*****

1 of 1

Code No: V3209

R07

Set No: 3

III B.Tech. II Semester Supplementary Examinations, December - 2012

INSTRUMENTATION

(Electrical and Electronics Engineering)

Time: 3 Hours

Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

*****

1. How the errors in measurement are classified? Explain the errors by giving suitable examples. Discuss the means adopted to minimize these errors? [16]

2. Explain the techniques of pulse-time modulation and pulse code modulation and their relative merits? [16]

3. a) Describe how the frequency and phase angle measurement can be made with the use of a cathode ray oscilloscope?
    b) A CRT has an anode voltage of 2000V and parallel deflecting plates 2 cm long and 5 mm apart. The screen is 30 cm from the centre of the plates. Find the input voltage required to deflect the beam through 3 cm. The input voltage is applied to the deflecting plates through amplifiers having an overall gain? [8+8]

4. a) What are the operating and performance characteristics of a DVM?
    b) Explain the principle of a successive approximation type DVM with a neat sketch? [8+8]

5. a) Describe the basic spectrum analyzers analyzer with a neat sketch?
    b) Draw the circuit diagram and explain the working of a heterodyne type wave analyzer? [8+8]

6. a) Explain the constructional features of synchro's ? Explain how the synchro's can be used as an error detector in a servomechanism?
    b) A strain gauge with a gauge factor of 4 is used for testing a machine. If the gauge resistance is 100 Ω and the strain is 20×10^{-6}, how much will the resistance of strain gauge change? [10+6]

7. a) Explain the construction and working of the LVDT accelerometer?
    b) An LVDT is used in an accelerometer to measure seismic mass displacement. The LVDT and signal conditioning outputs are 0.31 mV/mm with a ± 20 mm core displacement. The spring constant is 240 N/m and the core mass is 0.05 kg. Find (i) relation between acceleration in m/sec^2 and the output voltage (ii) natural frequency (iii) maximum acceleration measurable. [8+8]

8. What is the principle of ultrasonic flow meter. Explain the operation of ultrasonic flow meter with neat sketch? [16]

*****

1 of 1

Code No: V3209

R07

Set No: 4

III B.Tech. II Semester Supplementary Examinations, December - 2012
INSTRUMENTATION
(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
*****

1   Discuss the systematic errors giving suitable examples. Explain the measures taken to minimize these errors? [16]

2   a) Explain the following processes as applied to pulse code modulation
        i. Quantization process   ii. Encoding process.
    b) Describe the following modulation processes
        i. Pulse amplitude modulation.   ii. Pulse frequency modulation.   [8+8]

3   a) What are the different types of amplifiers used for CROs? Describe the basis on which they are classified?
    b) A sinusoidal input is applied to the vertical input of an oscilloscope starting at t=0. The following Lissajous patterns are obtained when a sinusoidal input is applied to the horizontal terminals. Estimate the phase shift between vertical and horizontal inputs? [8+8]

(a)   (b)   (c)   (d)   (e)
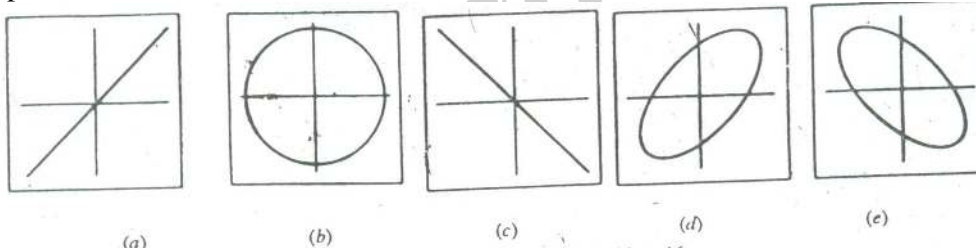
4   a) State the advantages of a DVM over an analog meter?
    b) Explain the working of a digital phase angle meter with neat sketch?   [8+8]

5   a) What is the difference between a wave analyzer and a harmonic distortion analyzer?
    b) Describe the working of Peak reading and RMS voltmeters with a neat sketch?
                                                                                            [8+8]

6   a) Explain the working of Thermocouples?
    b) A stain gauge is bonded to a steel beam 0.25m long and has cross sectional area of 0.4×10^{-3} m^2. Young's modulus of elasticity for steel is 207 GN/m^2. The strain gauge has a unstrained resistance of 240Ω and a gauge factor of 2.20. When the load is applied, the gauges resistance changes by 0.013 Ω. Calculate the change in the length of steel beam and the amount of force applied to the beam.   [8+8]

1 of 2

R07

Set No: 4

7 Explain the working of strain gauge type of torque transducers. Discuss the advantage and disadvantages? [16]

8 Describe the different electrical methods for measurement of liquid level. Compare their advantages and disadvantages? [16]

*****