

**III B.Tech II Semester Supplementary Examinations,
November/December 2005
ELECTRONIC MEASUREMENTS & INSTRUMENTATION
(Common to Electronics & Communication Engineering and Electronics &
Telematics)**

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

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

1. (a) What type of errors are possible in dual slope integrator and suggest methods to minimize and eliminate them?
(b) A dual slope integrating type A/D converter has an integrating capacitor of 0.1micro farads and resistance of 100 kilo ohms. If the reference voltage is 5V, and output of the integration is not to exceed 15V. What is the maximum time the reference voltage can be integrated. Derive the formula used. [8+8]
2. The standard resistor arm of a Wheatstone bridge has a range from 0 to 100 ohm with a resolution of 0.001 ohm. The galvanometer has an internal resistance of 100 ohm and can be read to 0.5 μ A. The other two arms have each 1 kohm. The bridge is supplied with a 10 V DC source. When the unknown resistance is 50 ohm, what is the resolution of the bridge in
 - (a) ohms and
 - (b) per cent of the unknown. [16]
3. Discuss the technique and procedure of measuring low impedance components using a Q-meter in series connection mode. Derive expressions for all the unknowns (R_s , L_s , C_s and Q_s) that can be measured . [16]
4. Explain the principle of frequency counter. How is the multiplexed display used in a frequency counter? [16]
5. (a) Explain the difference between the internal graticules and external graticules.
(b) Explain the functional block diagram of the vertical deflection system in detail. [8+8]
6. (a) Draw the block diagram of X-Y recorder and explain it. Give few examples of it. [3+5+2=10]
(b) What are the advantages of Magnetic tape recorders. [6]
7. (a) Explain the working of a piezoelectric transducer with suitable equations and sketches.
(b) Derive an expression for gauge factor for a strain gauge. [8+8]
8. (a) Show with an example, how the capacitive transducer has excellent frequency response? [8]

(b) What is temperature co-efficient of resistor? Explain in detail. [3+5=8]

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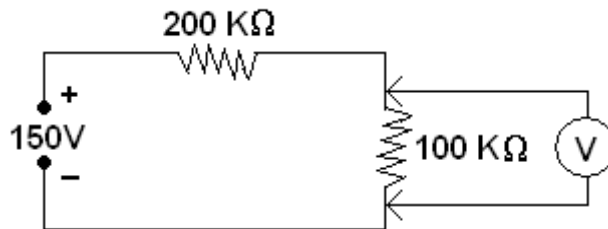
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1. (a) What is meant by voltmeter sensitivity? Explain its relevance in circuit applications. What is meant by loading effect? What circuit arrangement is done to avoid the same.
- (b) It is desired to measure the voltage across the $100\text{K}\Omega$ resistor in the circuit given below. Two voltmeters are available for this measurement. Voltmeter 1 with a sensitivity of $1000\Omega/\text{V}$ and voltmeter 2 with a sensitivity of $20,000\Omega/\text{V}$. Both meters are used on their 50V range. Calculate i) the reading of each meter ii) error in each reading, expressed as a percentage of the true value.

[8+8]



2. The standard resistor arm of a Wheatstone bridge has a range from 0 to 100 ohm with a resolution of 0.001 ohm. The galvanometer has an internal resistance of 100 ohm and can be read to $0.5\mu\text{A}$. The other two arms have each 1 kohm. The bridge is supplied with a 10 V DC source. When the unknown resistance is 50 ohm, what is the resolution of the bridge in
 - (a) ohms and
 - (b) per cent of the unknown. [16]
3. Draw the equivalent circuit of a current transformer and derive expressions for its transformation ratio and phase angle. Draw the phasor diagram also. [16]
4. Explain the principle of frequency counter. How is the multiplexed display used in a frequency counter? [16]
5. (a) Derive the equations for Resistive voltage divider and capacitive voltage divider of compensated attenuator.

- (b) Explain the method of finding phase, frequency relationship of two waveforms using Lissajous figures.
- (c) What are the advantages of using an active probe. [6+6+4]
- 6. (a) Discuss the elements of a Tape Recorder.
- (b) Explain the direct recording method in detail. [8+8]
- 7. (a) What are the crystalline materials used as transducers. What are their merits and demerits? [4+4=8]
- (b) Derive an expression for finding the voltage developed across a crystal. Explain how temperature affects it? [4+4=8]
- 8. (a) Name some common types of strain gauges? [5]
- (b) What characteristics determine the size of the strain gauge? [5]
- (c) Explain the functioning of a foil type strain gauge. [6]

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1. (a) What are the advantages of using a true RMS voltmeter and what are its critical applications.
(b) What is the necessity of an electronic voltmeter? Explain with reasons.
(c) What are the advantages of digital voltmeters over conventional indicating meters. [5+5+6]
2. The standard resistor arm of a Wheatstone bridge has a range from 0 to 100 ohm with a resolution of 0.001 ohm. The galvanometer has an internal resistance of 100 ohm and can be read to $0.5 \mu\text{A}$. The other two arms have each 1 kohm. The bridge is supplied with a 10 V DC source. When the unknown resistance is 50 ohm, what is the resolution of the bridge in
(a) ohms and
(b) per cent of the unknown. [16]
3. (a) What are the uses of instrument transformers ?
(b) Discuss the disadvantages of using shunts and multipliers to extend range in instrument transformers.
(c) Define the various “ Ratios ” with reference to CTs and PTs. [5+5+6]
4. Describe with the help of suitable circuit diagrams, how the following types of measurements are carried out using a digital frequency meter.
(a) Time interval measurement
(b) Multiple ratio measurement [16]
5. (a) Draw the diagram of compensated 10:1 voltage divider probe and explain it.
(b) A Lissajous pattern on an Oscilloscope is stationary and has 5 horizontal tangencies and 2 vertical tangencies. The frequency of horizontal input is 1000 HZ. Determine the frequency of vertical input.
(c) What are the differences between dual trace and dual beam CROs? [6+5+5]
6. (a) Explain the two types of analog storage of oscilloscopes? [2x3=6]
(b) What are the differences between Digital storage oscilloscope and conventional storage oscilloscope. [6]

- (c) A sampling oscilloscope is being used to observe a 400 MHz sine wave. A sampling pulse occurs every 3 ns. Draw five cycles of the 400 MHz signal and place a dot at the sampled point on each of the five cycles. [4]
7. (a) What are the modes of operation of piezoelectric crystals? Explain in detail. [2+4=6]
- (b) Draw the equivalent circuit of piezoelectric transducer. [4]
- (c) Explain the properties of piezoelectric crystals. [6]
8. (a) What are the advantages and disadvantages of LVDT? [4+4=8]
- (b) What is differential output of LVDT and explain the errors involved in the measurements using LVDT. [8]

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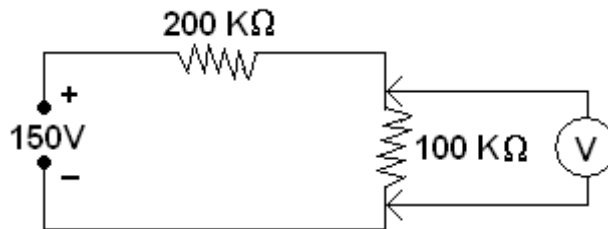
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 - (a) ohms and
 - (b) per cent of the unknown. [16]
3. (a) Describe the design and constructional features of employed in PTs for reduction of ratio and phase angle errors.
- (b) A single phase PT has a turns ratio of 3900/65. The nominal secondary voltage is 63 V and the total equivalent resistance and leakage reactance referred to the secondary side are 2Ω and 1Ω respectively. Calculate the ratio and phase angle errors when the transformer is supplying a burden of $100 + j 220\Omega$. State the assumptions made. [10+6]

4. (a) How time is measured using Quartz clock.
(b) Give the block diagram of a multiple period measuring system and explain the measurement technique. [8+8]
5. (a) Derive the relation for deflection sensitivity 'S' of a CRT.
(b) Explain the applications of CRO? [8+8]
6. (a) Explain the Digital data recording technique.
(b) Explain the tracking generator counter applications. [8+8]
7. (a) Illustrate the principle of force summing devices using suitable examples and sketches.
(b) What are the main elements of velocity transducer? [8+8]
8. (a) Show with an example, how the capacitive transducer has excellent frequency response? [8]
(b) What is temperature co-efficient of resistor? Explain in detail. [3+5=8]
