

III B.Tech II Semester Regular Examinations, Apr/May 2007
ELECTRONIC MEASUREMENTS AND 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) Explain in case of DVM
 - i. $3\frac{1}{2}$ digits ,
 - ii. $5\frac{1}{2}$ digits. What is the significance of $\frac{1}{2}$ digit.(b) Explain about the conversion logic used in case of simultaneous type of A/D DVM. [8+8]

2. Calculate the range of standard resistance in a Wheatstone bridge if
 - (a) the unknown resistance is in the range of 1 -100kohm and the other two arms have each 10 kohm
 - (b) the unknown resistance is 10 kohm and arm opposite to the standard resistor is 1 kohm and the other arm has range of 2 -20 kohm
 - (c) Explain the use of Thevenin's theorem in the analysis of Wheatstone bridge. [5+5+6]

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 $2\ \Omega$ and $1\ \Omega$ 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) Explain the principles of frequency and time measurements.
(b) Explain the operation of a simple frequency counter together with waveforms. [8+8]

5. Write short notes on the following
 - (a) Electrostatic Deflection
 - (b) Screens for CRTs [16]

6. (a) What are the merits and demerits of FM recording. [3+3=6]
(b) The gap of a tape recorder is $6.25\ \mu\text{m}$. Determine the speed of the tape so as to have a satisfactory response at 50,000 Hz. Assume that recorded wave length must be greater than 2.5 times the gap of the recorder. [5]

- (c) Write short notes on Portable Oscilloscopes. [5]
7. (a) Where are piezoelectric transducers mainly used and why? [4]
- (b) Give the equivalent circuit of a crystal and explain how a crystal is used as a transducer? [2+4=6]
- (c) Explain the construction and working of strain gauge. [3+3=6]
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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1. (a) Determine the resistor value required to use a 0-1mA d'Arsonval meter with an internal resistance 250Ω for 0-25V meter.
(b) What value of shunt resistance is required for using a 50μ A meter movement, with an internal resistance of 150Ω for measuring 0-800mA.
(c) Write about various thermocouples . [5+5+6]
2. (a) Derive an expression for balance in an Anderson's bridge . Draw the phasor diagram under balance conditions.
(b) List the advantages and disadvantages of Anderson's bridge. [8+8]
3. (a) At its rated load of 25 VA, a 100/5 A current transformer has an iron loss of 0.20 W and a magnetizing current of 1.6 A. Calculate its ratio error and phase angle when supplying rated output to a meter having ratio of resistance to reactance of 5.
(b) The magnetizing current of a ring core CT with ratio 1000/5 A, when operating at full primary current with a secondary burden consisting of non-inductive resistance of 1Ω is 1 A, at a PF of 0.4. Determine
 - i. The phase displacement between primary and secondary current
 - ii. The ratio error at full load assuming that there has been no turns-compensation. [6+5+5]
4. (a) What is meant by distortion factor? Explain its measurement with the help of a block diagram.
(b) Draw the circuit of a phase detector and explain how phase is measured?[8+8]
5. Describe the following:
 - (a) Sources of Synchronisation.
 - (b) Blanking circuit
 - (c) Focus control. [6+5+5]
6. (a) Draw and discuss the spectral displays of various modulations using Spectrum analyzer.
(b) Write about portable oscilloscopes. [8+8]

Code No: RR320403

Set No. 2

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]

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1. (a) Explain the basic principle of a digital voltmeter.
(b) Explain with the help of neat Circuit diagram, the working of a dual slope Digital voltmeter. [6+10]

2. (a) A Maxwell bridge is used to measure an inductive impedance at a frequency of 3 kHz. The bridge constants at balance are arm 1: a capacitor of value $0.02 \mu F$ in shunt with 390 kohm; arm 3 opposite to the arm 1 is having the unknown component; the other arms have each 18 kohm resistor. Find the equivalent series circuit of the unknown impedance. What is the value of the quality factor?
(b) What is the usual procedure for balancing the Maxwell bridge? What is the necessity for following such a procedure? Explain with the circuit diagram. [8+8]

3. (a) Explain various methods of measuring the impedance of a circuit using Q ? meter.
(b) Explain the working principle of a Q meter. [8+8]

4. (a) Explain the block diagram of frequency counter with waveforms associated with the gating function of the frequency counter.
(b) Explain the logic diagram of a time base of a frequency counter. [8+8]

5. Describe the following:
(a) Sources of Synchronisation.
(b) Blanking circuit
(c) Focus control. [6+5+5]

6. (a) What are the merits and demerits of FM recording. [3+3=6]
(b) The gap of a tape recorder is $6.25 \mu m$. Determine the speed of the tape so as to have a satisfactory response at 50,000 Hz. Assume that recorded wave length must be greater than 2.5 times the gap of the recorder. [5]
(c) Write short notes on Portable Oscilloscopes. [5]

7. (a) What are the modes of operation of piezoelectric crystals? Explain in detail. [2+4=6]

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Set No. 3

- (b) Draw the equivalent circuit of piezoelectric transducer. [4]
- (c) Explain the properties of piezoelectric crystals. [6]
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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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 (figure 1b). 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]

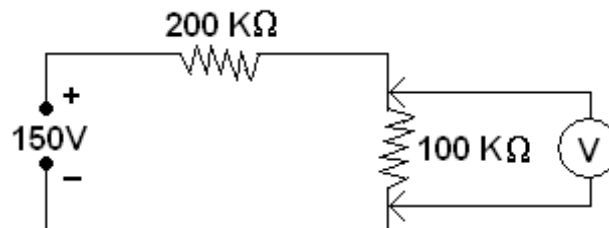


Figure 1b

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) Draw the circuit of a basic Q-meter and explain its principle of operation using a vector diagram.
- (b) Discuss the “ Direct- connection” technique of using Q-meter. [10+6]
4. (a) Give the block diagram of a very low frequency comparator system and explain.
- (b) What are the advantages with this method?
- (c) What are the different methods used for high frequency measurement? [4+6+6]
5. (a) Draw the block diagram of vertical amplifier and explain its working.

- (b) Draw the block diagram of dual-trace CRO and explain it. [8+8]
6. (a) Explain the FM recording method.
- (b) Write short notes on X-Y Plotters. [8+8]
7. (a) Explain the equivalent circuit of piezoelectric crystal under conditions of load. [6]
- (b) What are the uses of piezoelectric transducers? [5]
- (c) Draw the experimental set up measuring force using piezoelectric crystal. [5]
8. (a) With neat sketches and suitable equations explain the working of a capacitive transducer?
- (b) Explain the operation of a potentiometric transducer. [8+8]
