

AMIETE – ET (Current & New Scheme)

Time: 3 Hours

DECEMBER 2015

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. The accuracy of an instrument is determined by _____
- (A) closeness of indicated value to the actual value
(B) repeatability of measured value
(C) speed with which the reading approaches final value
(D) least value which can be measured
- b. The difference between measured value and true value is called _____
- (A) gross error (B) relative error
(C) probable error (D) absolute error
- c. In a Kelvin's Double Bridge, two sets of readings are taken when measuring a low resistance, one with the current in one direction and the other with direction of current reversed. This is done to _____
- (A) eliminate the effect of thermo-electric emfs
(B) eliminate the effect of resistance of leads
(C) correct for changes in battery voltage
(D) eliminate the effect of contact resistance
- d. In an Anderson Bridge, the unknown inductance is measured in terms of _____
- (A) known inductance and resistance
(B) known inductance
(C) known capacitance and resistance
(D) known capacitance

- e. A True RMS Reading Voltmeter uses two thermocouples in order _____
- (A) to increase sensitivity
 - (B) that the second thermocouple cancels out the non-linear effects of the first thermocouple
 - (C) to prevent drift in the d.c.amplifier
 - (D) none of these
- f. A Q meter uses the principle of _____
- (A) variation of self inductance
 - (B) variation of mutual inductance
 - (C) series resonance
 - (D) variation of capacitance
- g. The increase in intensity of trace in a CRO causes a change in _____
- (A) beam current
 - (B) frequency of time base
 - (C) gain of Y amplifier
 - (D) accelerating voltage
- h. Harmonic distortion analyser _____
- (A) measures amplitude of each harmonic
 - (B) measures rms value of fundamental frequency component
 - (C) measures rms value of all harmonics except fundamental frequency
 - (D) displays rms value of each harmonic on screen of CRO
- i. Capacitive Transducers are normally used for _____
- (A) static measurements
 - (B) dynamic measurements
 - (C) both static and dynamic measurements
 - (D) transient measurements
- j. X-Y Recorders record _____
- (A) one quantity with respect to another quantity
 - (B) one quantity on X axis with respect to time on Y axis
 - (C) one quantity on Y axis with respect to time on X axis
 - (D) none of these

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

- Q.2** a. What is meant by hysteresis? Explain its phenomenon in measurement systems with neat diagrams. (7)
- b. A voltmeter having a sensitivity of $1000 \Omega/V$ reads 100V on its 150 V scale when connected across an unknown resistor in series with a milli-ammeter. When the milli-ammeter reads 5mA. Calculate:
- (i) apparent resistance of the unknown resistor,
 - (ii) actual resistance of the unknown resistor and
 - (iii) error due to the loading effect of voltmeter. (6)
- c. Write the basic difference between steady state response and transient response. (3)

- Q.3** a. Draw the circuit of Wheatstone Bridge used for measurement of medium resistance. Explain its operation and derive the condition for its balance. (8)
- b. A Wheatstone bridge has ratio arms of $1000\ \Omega$ and $100\ \Omega$ and is being used to measure an unknown resistance of $25\ \Omega$. Two galvanometers are available. Galvanometer 'A' has a resistance of $50\ \Omega$ and a sensitivity of $200\ \text{mm}/\mu\text{A}$ and galvanometer 'B' has values of $600\ \Omega$ and sensitivity of $500\ \text{mm}/\mu\text{A}$. The galvanometer is connected from the junction of the ratio arms to the opposite concerns. Find out: (5)
- (i) The value of standard resistance under balance condition.
- (ii) Which of the two galvanometers is more sensitive to a small unbalance on the above bridge and the ratio of sensitivities.
- c. Write the applications of high voltage Schering bridge. (3)
- Q.4** a. What is a DC Voltmeter? Draw the circuit of basic DC Voltmeter. Explain its operation and derive an expression for its series resistance (R_s). (6)
- b. A basic D'Arsonval movement with a Full Scale Deflection of $50\ \mu\text{A}$ and internal resistance of $500\ \Omega$ is used as a voltmeter. Determine the value of the multiplier resistance needed to measure a voltage range of $0 - 10\ \text{V}$. (3)
- c. With the help of a neat block diagram, explain the working of a basic Digital Multimeter. (7)
- Q.5** a. Explain the working of Dual Slope Integrating type DVM with neat block diagram. Give its advantages. (8)
- b. Draw the circuit diagram of Output Power Meter and explain its operation. Write its applications. (8)
- Q.6** a. Draw the block diagram of a Function Generator and explain the method of producing: (8)
- (i) Square waves and
- (ii) Sine waves
- b. What is the need of Sampling Oscilloscope? Draw its block diagram and explain its working with the help of waveforms at each block. (8)
- Q.7** a. Explain the working of Frequency Selective Wave Analyzer. Give its applications. (8)
- b. What is a Bolometer? Explain the working of Bolometer Mount with the help of a neat diagram. (8)
- Q.8** a. What is meant by Strip Chart Recorder? Explain basic Strip Chart Recorder with neat block diagram and write its applications. (9)
- b. Discuss the objectives and requirements of recording data. (7)
- Q.9** a. Write the applications of the following: (8)
- (i) Differential Output Transducer
- (ii) Capacitive Transducer
- (iii) Strain Gauge
- (iv) Resistive Transducer
- b. Explain Multi Channel Data Acquisition System with neat block diagram. (8)