AMIETE – ET (OLD SCHEME)

Code: AE12 **Subject: INSTRUMENTATION AND MEASUREMENT**
Time: 3 Hours **Max. Marks: 100**

JUNE 2009

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.**
- **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 smallest change in measured variable to which an instrument will respond is

(A) Accuracy. **(B)** Resolution.
(C) Precision. **(D)** Sensitivity.

b. A wheatstone bridge requires a change of 6 ohm in the unknown arm of the bridge to produce a change in deflection of 3 mm of the galvanometer. The sensitivity of the instrument is

(A) 0.5%. **(B)** 2%.
(C) 0.5 mm/ohm. **(D)** 2.0 ohm/mm.

c. The zero error of an instrument is

(A) Gross error. **(B)** Systematic error.
(C) Random error. **(D)** Indefinite error.

d. Primary standard for voltage maintained by National standard laboratories is a

(A) Zero diode with 1.5 V output .
(B) Weston standard cell with 1.01858 V at $20^{\circ}C$.
(C) Nickel Cadmium rechargeable cell with 1.25 V output at $20^{\circ}C$.
(D) Josephson thin film junction near 273 K.

e. The internal resistance of the millammeter must be very low for

(A) High sensitivity.
(B) High accuracy.
(C) Max voltage drop across meter.
(D) Max effect on the current in circuit.

f. A DC voltmeter has a sensitivity of $1000\ \Omega/\text{volt}$, when it measures half full scale deflection in 100 V range, the current through the voltmeter is

(A) 100 mA. **(B)** 1 mA.
(C) 0.5 mA. **(D)** 50 mA.

g. Which of the following transducer is used for magnetic flux density measurement?

(A) LVDT **(B)** Synchro

(C) Hall effect transducer **(D)** Thermocouple

h. In a Q meter, a small resistance R is added to the series resonant circuit to inject the oscillatory voltage to the circuit. If R_s is the apparent series resistance of the circuit at resonance, the value of actual Q will be

(A) $\frac{\text{Observed Q}}{1+R/R_s}$. **(B)** Observed $Q(1+R/R_s)$.

(C) $\frac{\text{Observed Q}}{1+R_s/R}$. **(D)** $\text{Observed } Q(1+\frac{R_s}{R})$.

i. Input impedance of a CRO is nearly

(A) Zero. **(B)** 10 Ω.
(C) 100 Ω. **(D)** 1 MΩ.

j. A strain guage bridge measures the strain in a cantilever where the gauge is fixed with strain $\in$, the gauge resistance increases from 110 Ω to 110.52 Ω. If the gauge factor is 2.03, then strain in the cantilever will be

(A) 2.33×10^{-3}. **(B)** 3.15×10^{-3}.
(C) 3.81×10^{-3}. **(D)** 4.33×10^{-3}.

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

Q.2 a. Explain the following terms : **(8)**

(i) Accuracy (ii) Dynamic error
(iii) Settling time (iv) Precision

b. Explain different types of errors that occur in measuring instruments. How do you compute error limit? **(8)**

Q.3 a. What are elements of electronic multimeter? Draw and explain the basic circuits of this instrument. **(8)**

b. Define Q factor of a coil. Explain with circuit diagram the construction and working of a basic Q meter. **(8)**

Q.4 a. Describe with block diagram a sweep frequency generator and its applications. **(8)**

b. Draw the schematic of digital frequency meter and explain its operation. **(8)**

Q.5 a. Why CRO is considered to be most versatile instrument in an electronic Laboratory? Describe the working principle of a CRO with the help of its block diagram. **(8)**

b. Explain with the help of schematic diagram the working of a storage oscilloscope. **(8)**

Q.6 a. Why magnetic measurements are more accurate then other types of measurement? How will you obtain hysteresis loop of a material under AC operating conditions. **(8)**

b. Describe Bolometer method for power measurement **(8)**

Q.7 a. How does a wave analyser differ from harmonic distortion analyser? Describe harmonic distortion analyser with the help of a block diagram. (**8**)

b. Define sensitivity. How is it measured? (**8**)

Q.8 a. Why selection of transducer is important? Give the points to be considered in determining a transducer suitable for a specific measurement ? (**8**)

b. What is Hall effect? Describe the working principle, and applications of Hall effect. **(8)**

Q.9 a. Explain a 4-bit R-2R ladder type of DAC. Compare it with weighted resister type DAC. **(8)**

b. What is multiplexing? Explain frequency division and time division multiplexing. **(8)**