AMIETE – ET (OLD SCHEME)

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

JUNE 2010

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. A set of readings has a wide range and therefore it has

(A) low precision **(B)** high precision
(C) low accuracy **(D)** high accuracy

b. Wien's bridge is used for measuring

(A) inductance **(B)** resistance
(C) capacitance **(D)** frequency

c. A true rms reading voltmeter uses two thermocouples so that

(A) sensitivity get increased
(B) accuracy get increased
(C) non-linear effects of first thermocouple be cancelled
(D) all of the above

d. Post acceleration is needed in a CRO if the frequency of signal is

(A) less than 1 MHz **(B)** more than 1 MHz
(C) more than 10 MHz **(D)** more than 10 Hz

e. An oscilloscope indicates

(A) peak to peak value of voltage
(B) dc value of voltage
(C) rms value
(D) average value.

f. A spectrum analyser displays

(A) different frequency amplitudes w.r.t. time
(B) Peak to Peak amplitude of modulating signal
(C) different signal amplitudes w.r.t. frequency
(D) lissajous figure.

g. The number of comparators needed in parallel conversion type 8 bits ADC is

(A) 8 **(B)** 16
(C) 255 **(D)** 256

h. The strain gauge having the highest gauge factor (G).

(A) constantan **(B)** isoelastic
(C) platinum tungsten **(D)** semiconductor

i. The output of a piezoelectric crystal has

(A) low amplitude and low impedance.
(B) high amplitude and high impedance.
(C) low amplitude and high impedance.
(D) high amplitude and low impedance.

j. The resolution of a $3\frac{1}{2}$ digit DVM having a basic range of 2 volts is
(A) 2 V. **(B)** 1 mV.
(C) 0.25 V. **(D)** 0.125 V.

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

Q.2 a. Define accuracy, precision, repeatability and resolution. **(8)**

b. Draw the function block of VOM and explain the elements it consists of. **(8)**

Q.3 a. Describe the different types of errors occur in measurement. Discuss the means adopted to minimize these errors. **(8)**

b. In a Schering bridge balance, the following values are obtained. $C_2 = 100\,pF;\ R_3 = 100\,\Omega;\ R_4 = 300\,\Omega;$ $C_4 = 0.5\,\mu F;$ f= 50 Hz. Find the unknown capacitance C_1 and its loss angle δ. **(8)**

Q.4 a. Fig.1 shown is an ac bridge, the value of parameter shown being those corresponding to bridge being balanced. Calculate the element values of
Z. (R and L or C as the case may be) **(8)**

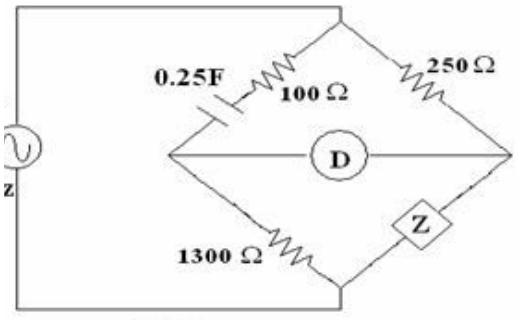

Fig.1

b. What is sweep frequency generator? How the sweep frequency range is set in a sweep frequency generator? **(8)**

Q.5 a. Describe four applications of a CRO. **(8)**

b. Draw and explain the block schematic of a sampling oscilloscope. **(8)**

Q.6 a. What are the different errors in the measurement of electronic counters? Explain and suggest ways to reduce it. **(8)**

b. Explain the quieting method used to measure receiver sensitivity. We are testing receiver sensitivity by quieting method using an unmodulated signal generator, if the zero signal noise level is 6.9 V rms, what level represents 10 dB of quieting? **(8)**

Q.7 a. Explain in detail the method of power measurement using a thermocouple power meter. **(8)**

b. Define sensitivity and selectivity of a radio receiver. **(8)**

Q.8 a. A strain gauge having resistance of $120\,\Omega$ is mounted on steel cantilever beam. When a certain force is applied at the free end it produces a stress of 100 MN/m^2 at the section where strain gauge is mounted. The change in gauge resistance is found to be $0.15\,\Omega$ due to this stress. Calculate the gauge factor (G) given young's modulus for steel is $200\,GN/m^2$. **(8)**

b. Describe the construction, principle of working and applications of Hall effect transducers. **(8)**

Q.9 Write short note on the following:

(i) Spectrum Analyser.
(ii) Successive approximation Analog to Digital converter. **(2×8)**