DipIETE – ET (NEW SCHEME) – Code: DE59

Subject: ELECTRONIC INSTRUMENTATION AND MEASUREMENT

Time: 3 Hours

DECEMBER 2010

Max. Marks: 100

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 half an hour 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 expected value of the voltage across a resistor is 80V. The measurement gives a value of 79V. The relative accuracy is

(A) 0.9875   (B) 0.4
(C) 1.25   (D) 0.235

b. A set of independent voltage measurements taken by 4 observers was recorded as 117.02 V, 117.11 V, 117.08 V and 117.03 V. The range of error is

(A) ± 0.05V   (B) ± 0.25V
(C) ± 0.45V   (D) ± 1.25V

c. A DVM measures

(A) peak value   (B) rms value
(C) peak to peak value   (D) average value

d. The resolution of a DVM with 4 digit display is

(A) 1/14   (B) 1/1000
(C) 1/10000   (D) 1/10

e. The input resistance of a Cathode ray oscilloscope is of the order of

(A) tens of ohm   (B) mega ohm
(C) kilo ohm   (D) fraction of an ohm

f. A vertical amplifier for a CRO can be designed for

(A) only a high gain
(B) only a broad BW
(C) a constant gain times bandwidth product
(D) all of the above

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g. A voltage controlled oscillator is an instrument whose frequency is dependent upon

   (A) the amplitude of input signal
   (B) the phase of input signal
   (C) both amplitude and phase of the input signal
   (D) None of the above

h. A triangular waveform is obtained

   (A) by integrating a square wave   (B) by differentiating a square wave
   (C) by integrating a sine wave   (D) by differentiating a sine wave

i. Strain gauge is used for the measurement of

   (A) displacement   (B) force
   (C) pressure   (D) all the three

j. Thermistors have

   (A) negative temperature co-efficient (B) positive temperature co-efficient
   (C) neutral temperature co-efficient (D) none of the above

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

Q.2 a. Define
   (i) Accuracy   (ii) Precision
   (iii) Dead Time   (iv) Hysteresis   **(8)**

   b. A voltmeter reading 80 V on its 100 V range and an ammeter reading 90 mA
      on its 150 mA range are used to determine the power dissipated in a resistor.
      Both these instruments are guaranteed to be accurate within $\pm 2.5\%$ at full
      scale deflection. Determine the limiting error of the power.   **(8)**

Q.3 a. What are the effects on the calibrations of a thermocouple? Explain.   **(6)**

   b. Calculate the value of the multiplier resistor for a 10V rms AC range on the
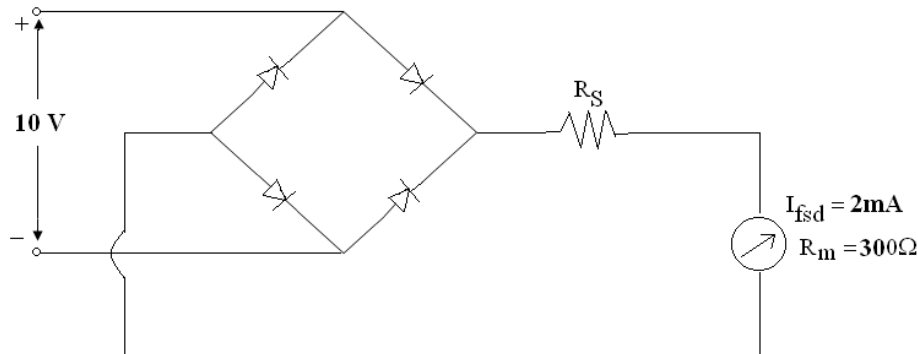   voltmeter in Fig.1.   **(5)**

Fig.1

c. Compare the working of peak responding voltmeter with that of averag[e] responding voltmeter. **(5)**

Q.4 a. An unbalanced wheatstone bridge is given in Fig.2. Calculate the current through the galvanometer. **(6)**
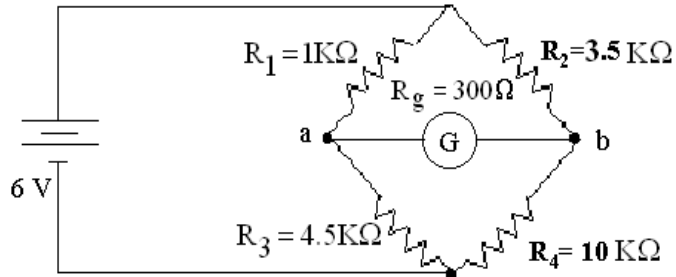

Fig.2

b. Derive the expression for the measurement of unknown resistance using Kelvin's double bridge. How the effect of connecting lead resistance is eliminated in this arrangement. **(10)**

Q.5 a. Compare the principle, advantages and disadvantages of Dual slope integrating type DVM with that of ramp type DVM. **(10)**

b. How is the phase difference between the two signals measured using digital phase meter? Explain. **(6)**

Q.6 a. Bring out the salient feature of a function generator with a neat block diagram. **(10)**

b. What is the role of vertical amplifier in a CRO? Explain with neat block diagram. **(6)**

Q.7 a. With the help of a block diagram, explain the working of spectrum analyser. **(8)**

b. Discuss the Salient features of a Heterodyne wave analyzer. **(8)**

Q.8 a. Give a brief on various types of recorders used in electronic measuring instruments. **(10)**

b. What are the general features to be considered whenever one is examining a recorder? **(6)**

Q.9 a. Explain the following w.r.t. single channel Data Acquisition System
(i) A/D converters. (ii) Pre amplification and filtering. **(8)**

b. Write short notes on
(i) Load Cell. (ii) Capacitive Transducers. **(8)**