ROLL NO. _____

DipIETE – ET (NEW SCHEME) – Code: DE59

Subject: ELECTRONIC INSTRUMENTATION AND MEASUREMENT

Time: 3 Hours **Max. Marks: 100**

DECEMBER 2011

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **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. Dead zone in a certain pyrometer is 0.125% of span. Calibration is 400°C to 1000°C. The temperature change that might occur before it is detected is

(A) 1°C **(B)** 0.5°C
(C) 0.75°C **(D)** 1.5°C

b. A $4\frac{1}{2}$ digital voltmeter is used for voltage measurement. On 10 V range, 0.6983 is displayed as _____

(A) 6.983 **(B)** 0.698
(C) 0.6983 **(D)** 6.98

c. A D'Arsonval meter of 200 Ω and of 0-1 mA sensitivity is to work as voltmeter of full scale rating 10 V. The value of multiplier should be

(A) 1 kΩ **(B)** 10 kΩ
(C) 9800 kΩ **(D)** 900 Ω

d. A.C. bridge circuits are used for the measurement of

(A) inductance **(B)** capacitor
(C) storage factor **(D)** all of the above

e. A thermometer is calibrated as 150°C to 200°C. The accuracy is specified within ±0.25% of instrument span. The maximum static error is

(A) ±0.2°C **(B)** ±0.05°C
(C) ±0.125°C **(D)** ±1.25°C

f. A 600 V voltmeter is specified to be accurate within $\pm 2\%$ of full scale. The limiting error when the instrument is used to measure a voltage of 250 V is

(A) 4.8% **(B)** 5.4%
(C) 6.2% **(D)** 2.8%

g. Digital instrument have input impedance of the order of

(A) $1\,\Omega$. **(B)** $k\,\Omega$
(C) $M\,\Omega$. **(D)** $m\,\Omega$

h. Dummy strain gauges are used for

(A) Compensation of temperature changes
(B) Increasing the sensitivity of bridge in which they are included
(C) Compensating for different expansion
(D) Calibration of strain gauges

i. Capacitive transducers are normally used for

(A) static measurements **(B)** dynamic measurements
(C) both **(A)** and **(B)** **(D)** transient measurements

j. A resistance potentiometer is a

(A) first order instrument **(B)** zero order instrument.
(C) second order instrument **(D)** none of the above

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

Q.2 a. Explain the following terms:
(i) Repeatability (ii) Resolution
(iii) Precision and (iv) Linearity **(8)**

b. Discuss the following types of static error occurs in measuring instrument
(i) Gross error (ii) Systematic error and
(iii) Random error. **(8)**

Q.3 a. Derive the expression for the measurement of capacitance and loss angle of a lossy capacitor using Schering's Bridge. **(8)**

b. A Wheatstone Bridge is shown in Fig. 1. The value of resistances are $P=1\ k\Omega$, $S=5k\Omega$, $G=100\,\Omega$, $R=1K\Omega$. Thevenin source generates voltage $E_o=24mV$ and the galvanometer current is $13.6\,\mu A$. Calculate the value of Q. **(8)**

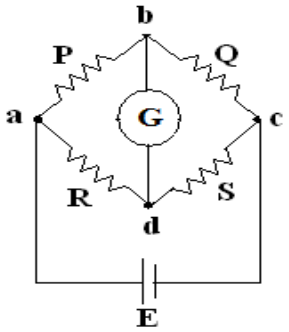

Fig. 1

Q.4 a. Discuss different types of thermocouples with neat diagram. Give its limitations **(8)**

b. Convert a basic D'Arsonval movement with an internal resistance of 50 Ω and a full scale deflection current of 2mA into a multirange d.c voltmeter with voltage ranges of 0-10 V, 0-50 V, 0-100 V and 0-250 V **(8)**

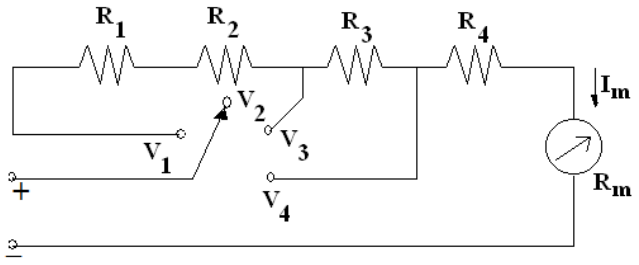

Fig. 2

Q.5 a. An integrator contains a 100 kΩ and 1 μF capacitor. If the voltage applied to the integrator input is 1 V. What voltage will be present at the output of integrator after 1 sec? Now, if an reference voltage is applied to the same integrator at time t_1 is 5 V in amplitude. What is the time interval of t_2. **(8)**

b. Explain the working of a digital phase meter. **(8)**

Q.6 a. Bring out the salient features of a pulse generator with a neat block diagram. **(8)**

b. Briefly discuss the basic elements of a storage oscilloscope. **(8)**

Q.7 a. What is harmonic distortion? With a neat block diagram, explain the features of a fundamental –suppression distortion meter. **(8)**

b. Write a note on calorimetric method of measurement of RF power. **(8)**

Q.8 a. Explain the principle, advantages and working of potentiometric recorders. **(8)**

b. What are the general features to be considered when selecting recorder for a particular application. **(8)**

Q.9 a. With respect to signal conditioning of the inputs, explain
(i) Ratiometric Conversion.
(ii) Logarithmic Conversion. **(8)**

b. What is LVDT? Describe its operating principle. Also discuss its advantages and disadvantages. **(8)**