

DipLETE – ET (NEW SCHEME) – Code: DE59**Subject: ELECTRONIC INSTRUMENTATION
AND MEASUREMENT**

Time: 3 Hours

JUNE 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.
- 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 measure of the consistency or repeatability of measurement is called _____.

- | | |
|-----------------|----------------|
| (A) Sensitivity | (B) Accuracy |
| (C) Precision | (D) Resolution |

b. A null type of instrument as compared to a deflection type instrument has _____.

- | | |
|-----------------------|-------------------------|
| (A) A higher accuracy | (B) A lower sensitivity |
| (C) A faster response | (D) All of the above |

c. The value of capacitance of a capacitor is specified as 1-microfarad $\pm 5\%$, by the manufacturers. The limits between which value of the capacitance guaranteed:

- | | |
|-----------------------------|-----------------------------|
| (A) 0.3 to 0.4 microfarad | (B) 0.95 to 1.05 microfarad |
| (C) 0.15 to 0.25 microfarad | (D) 0.04 to 0.14 microfarad |

d. The measurement of medium resistance is done by _____.

- | | |
|-----------------------|----------------------------|
| (A) Wheatstone Bridge | (B) Kelvin's double Bridge |
| (C) Maxwell's Bridge | (D) Potentiometer |

e. Analog Spectrum analyzers are also called as _____.

- | | |
|------------------------|------------------------|
| (A) Fourier analyzer | (B) Digital analyzer |
| (C) Real time analyzer | (D) None of the above. |

f. Digital instruments have I/P Impedance of the order of _____.

- | | |
|-----------------|-----------------|
| (A) $1\ \Omega$ | (B) $K\ \Omega$ |
| (C) $M\ \Omega$ | (D) $m\ \Omega$ |

g. Thermocouple instruments can be used for a frequency range

- | | |
|-----------------|-----------------------|
| (A) upto 100 Hz | (B) upto 5000 Hz |
| (C) upto 1 MHz | (D) 50 MHz and above. |

h. Accuracy of a digital voltmeter is specified as

- (A) % of actual reading (B) % of full scale reading
(C) Number of least significant digits (D) All of these.

i. The strip chart recorder records the variation of one or more variables with respect to _____.

- (A) Frequency (B) Phase
(C) Time (D) Amplitude

j. Strain gauge is an example of a _____ transducer.

- (A) active (B) passive
(C) digital (D) temperature

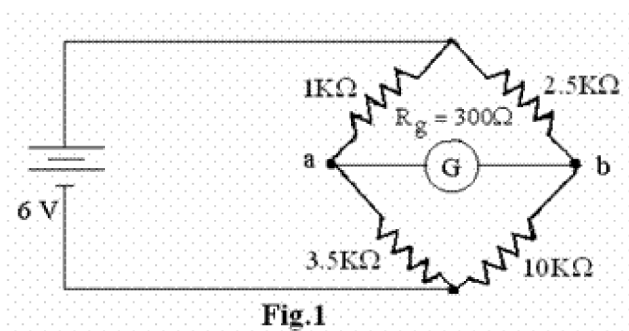
**Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.**

Q.2 a. Describe Gross errors, Systematic errors and Random errors. (8)

b. A voltmeter reading 70 V on its 100 V range and an ammeter reading 80 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 $\pm 1.5\%$ at full scale deflection. Determine the limiting error of the power. (8)

Q.3 a. Derive the expression for dissipation factor in Schering's bridge. (8)

b. An unbalanced bridge is given in Fig.1. Calculate the current through the galvanometer. (8)



Q.4 a. With a neat block diagram explain the working of True RMS voltmeter. (8)

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

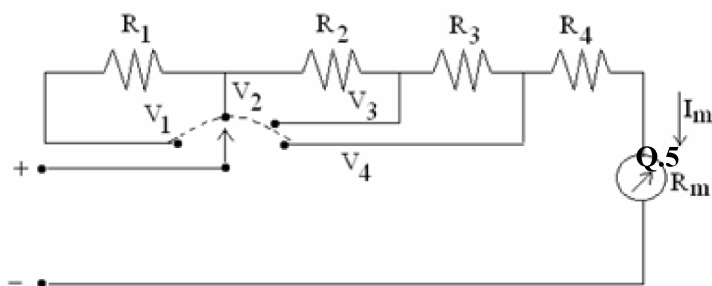


Fig.2

a. Explain the principle and working of a Dual slope Integrating type Digital voltmeter with a neat block diagram.

(8)

b. List out the salient features of a universal counter with block diagram. (8)

Q.6 a. With various waveforms at each block of a sampling oscilloscope, discuss its working. (10)

b. List out the requirements of a pulse for a pulse generator (Laboratory type). (6)

Q.7 a. Mention the advantages of
(i) Heterodyne wave analyzer (ii) Spectrum analyzer (iii) Harmonic distortion analyzer (6)

b. (i) With a neat figure discuss briefly the measurement of power by means of Bolometer Bridge. (6)

(ii) A small AF voltage of 20 V is superimposed on the RF test power and balance is achieved. If the bridge arms has a resistance of 100Ω . Calculate the RF test power. (4)

Q.8 a. With neat block diagram explain the working of X-Y recorder. Mention its applications. (12)

b. List out objectives and requirement of Recording data. (4)

Q.9 a. Derive an expression for the gauge factor for a Bonded resistance wire strain gauge. (12)

b. A resistance strain gauge with a gauge factor of 2 is cemented to a steel member, which is subjected to a strain of 1×10^{-6} . If the original resistance value of the gauge is 130Ω , Calculate the change in resistance. (4)