(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0323 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. IV) EVEN THEORY EXAMINATION 2012-13

ELECTRONIC INSTRUMENTATION AND MEASUREMENTS

Time : 3 Hours *Total Marks : 100*

Note :- (i) Attempt **ALL** questions.

(ii) Assume the missing data if any.

(iii) Marks are indicated at the end of each Section.

1. Attempt any **four** parts of the following : **(5×4=20)**

(a) What are the desirable characteristics of transducer element in respect of sensing any physical variable ?

(b) Mean Torque of an electro dynamometer type of Wattmeter may be written as $T \alpha M^p E^q Z^t$.

$M \rightarrow$ Mutual inductance between fixed and moving coil, E is applied voltage, z is impedance of load circuit. Determine the value of p, q, t from the dimensions of the quantities.

(c) Explain the limiting error. A 4 dial decade resistance box has its accuracy specified as follows :

(i) $X_1 \times 1000\ \Omega \pm 0.1\%$

(ii) $X_2 \times 100\ \Omega \pm 0.1\%$

(iii) $X_3 \times 10\Omega \pm 0.5\%$

(iv) $X_4 \times 1\Omega \pm 1\%$.

If R across the terminal of Decade Resistance Box is 4739 Ω, then determine the relative limiting error involved in this measurement ?

(d) How the limiting error is calculated when :

(i) Two or more variables are added

(ii) Product of two or more variable

(iii) Composite factor.

The value of an unknown R is calculated in terms of current drawn by it and the power it dissipates. If the limiting error involved in the measurement of power and current are 1.5% and 1% respectively. The relative limiting error in the measurement of R is ?

(e) An 820 Ω resistance with an accuracy of ± 10% carries a current of 10 mA. The current was measured by an analog ammeter on a 25 mA range. With an accuracy of ± 2% of full scale. Calculate the power dissipated in the resistor and determine the accuracy of the result.

2. Attempt any **two** parts of the following : **(10×2=20)**

(a) Describe the multimeter probes which can extend the range of measurement and sense the physical variables. What is the difference between the decibel (dB) and decibel-milliwatt (dBm) measurement ?

(b) The half wave restifier electronic Voltmeter circuit in the following fig, uses a meter with a FSD current of 1 mA. The meter coil resistance is 1.2 kΩ. Calculate the value of R_3 that will give meter full scale pointer deflection when ac input voltage is 100 mV (rms). Also determine the meter deflection when the input is 50 mV.

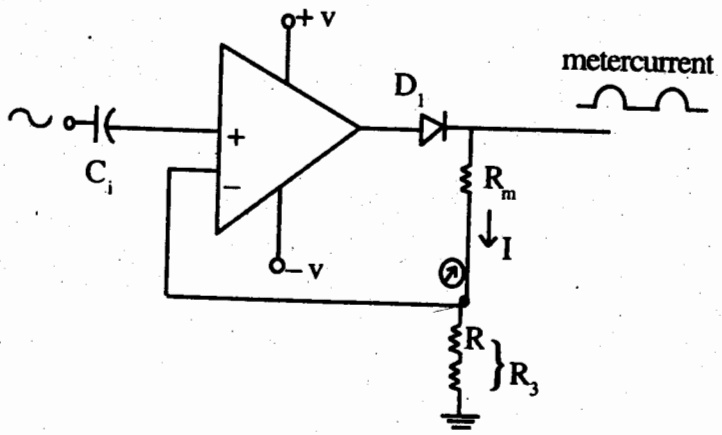

fig. 1

(c) An opamp meter shown in fig. is required to measure maximum input of 20 mV. The opamp input current is

0.2 μA and the meter circuit has Im = 100 μA FSD and R_m = 10 kΩ. Determine suitable resistance value for R_3 and R_4.

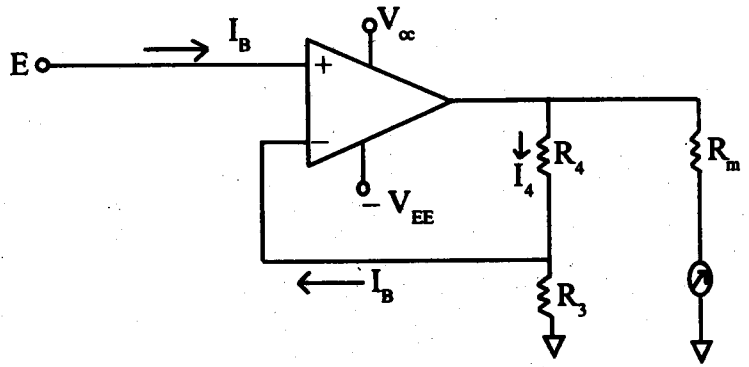

fig. 2

3. Attempt any **four** parts of the following : **(5×4=20)**

(a) Explain the working, principle and phasor diagram of Maxwell's capacitance Bridge.

(b) Explain the Budge method to measure the low resistance. What will we have to do to minimize the effect of lead resistance ?

(c) How the capacitance value is measured with the help of De-Sauty's Bridge ? This Bridge is used for which type of capacitor ?

(d) The 3 impedances of AC Bridge are $z_1 = 200\ \Omega < 60$, $z_2 = 400\ \Omega < 90$, $z_3 = 300\ \Omega < 0$, z_4 = ? When Bridge is Balanced ?

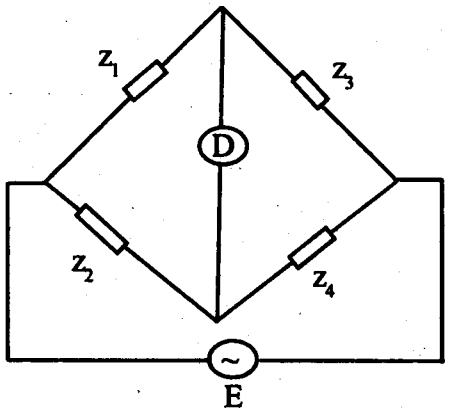

fig. 3

(e) How the voltmeter ammeter is used in measurement of medium Resistance and low Resistance ?

(f) How the sources and detectors are determined according to f range used in AC Bridge ? Write Balance condition for AC Bridge.

4. Attempt any **two** parts of the following : **(10×2=20)**

(a) Determine the minimum time/division sensitivity for an oscilloscope that is to be used investigate 50 MHz waveform. Assume that the time base magnifier expands the horizontal display by a factor of 5.

(b) A IV signal with a source resistance of RS = 600 Ω is connected to an oscilloscope which has an input impedance of R_i = 1 MΩ in parallel with C_i = 30 pF. The coaxial cable has a capacitance of C_{cc} = 100 pF. Calculate the oscilloscope terminal voltage (V_i) when s/g f is 100 Hz. Also determine the f at which V_i is 3 dB below V_s.

(c) Sketch the Block diagram of CRO and explain the working of it : What is the utility of input attenuator ? How is the loss of leading line occurred ?

5. Attempt any **two** parts of the following : **(10×2=20)**

(a) For the 10 and 50 readings in the calibration chart in figure below. Determine the instrument accuracy as a percentage of the reading and as a percentage of full scale.

Scale reading	Precise Voltage	Correction
100	103	+3
90	93	+3
80	82.5	+2.5
70	72.5	+2.5
60	62	+2
50	51.7	+1.7
40	41.5	+1.5
30	31	+1
20	19.7	–0.3
10	9.5	–0.5
0	0	0

(b) Sketch the circuit for calibration of wattmeter and explain the calibration procedure.

(c) Determine the displayed rise time when a pulse waveform with a rise time of 21 ns is applied to an oscilloscope that has an upper cut off frequency of :

(i) 20 MHz and

(ii) 50 MHz.