B.Tech.
(SEMESTER-III) THEORY EXAMINATION, 2012-13
ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

Time : 3 Hours / [ Total Marks : 100

Notes: 
(1) Assume suitable data wherever necessary.
(2) Use of Non-programmable calculator is permitted.
(3) Figures to the right indicate maximum marks.

Section – A

1. Answer the following questions in short: 

(a) State the classification of instruments with example.
(b) Differentiate between “accuracy” & “precision”.
(c) Why secondary of current transformer is never opened while its primary is energized?
(d) How ‘creeping’ error can be minimized in energy meters?
(e) Discuss the special features of potential coil in LPF wattmeter.
(f) Justify unsuitability of Hay Bridge for measurement of low Q inductor.
(g) Determine coil resistance if AC potentiometer reads \( V = 0.75 \angle 51^\circ \) through voltage ratio box of 100/1 and \( I = 6.13 \angle 12^\circ 6' \).
(h) Why magnetic measurements are important in electrical engineering?
(i) Discuss dual trace and dual beam CRO.
(j) Draw basic circuit (block diagram) of frequency meter.

2 \times 10 = 20
Section – B

Answer any three parts from the following:

2. (a) (i) Discuss, with block diagram, generalized instrumentation system.

(ii) Explain the construction and working of Electrodynamometer instrument.

(b) (i) A Kelvin bridge is balanced with: outer arm ratio as 100 Ω : 1000 Ω; inner ratio arm as 99.95 Ω : 1000.7 Ω; link resistance = 0.1 Ω; standard resistance = 0.0038 Ω. Calculate unknown resistance.

(ii) Draw Schering bridge and derive an expression for finding unknown capacitance and its series leakage resistance.

(c) (i) Describe the standardization process of Drysdale (polar type) AC potentiometer.

(ii) Discuss step by step method of determining hysteresis loop of magnetic material.

(d) (i) Discuss different types of distortions caused by amplifier due to non-linear components.

(ii) Explain the construction of CRO (using block diagram).

(e) (i) A current transformer with turns ratio 1 : 190 is rated as 1000/5A, 25 VA. Core loss and magnetizing component of primary current are 4A & 8A under rated conditions. Determine phase angle error and ratio error for rated burden and rated secondary current at 0.8 lag p.f. (Neglect sec. winding impedance).

(ii) Explain the construction and working of Weston type frequency metre.

Section – C

Answer any two parts from each questions:

3. (a) Currents in two parallel branches are $I_1 = 100 \pm 2$ A and $I_2 = 200 \pm 6$ A and $I = I_1 + I_2$. Find $I$ if errors in $I_1$ & $I_2$ are (a) limiting errors (b) std. deviation.

(b) Discuss primary standard of EMF with handling precautions.

(c) Explain, with phasor diagram, the power measurement in 3-phase circuit using 2-wattmeters and indicate how load pf can be determined in case of balanced load.
4. (a) Explain, with circuit diagram, how instrument transformer can be used to measure high power.

(b) Discuss the effect of secondary burden p.f. and current on errors in CTs.

(c) Discuss the construction and working of 1-phase p.f. meter.

5. (a) Discuss, with practical circuit, Q meter & its use to measure self capacitance of coil.

(b) Discuss Maxwell inductance and capacitance bridge for measuring inductance.

(c) Discuss ‘loss of charge’ method for high resistance measurement.

6. (a) Discuss the application of AC potentiometer for power measurement.

(b) Discuss wattmeter method to determine iron loss in ferromagnetic materials.

(c) Discuss the construction and working of flux meter.

7. (a) Discuss the working of any one type of digital voltmeter with block diagram.

(b) Discuss, with block diagram, electronic multimeter.

(c) Discuss how CRO can be used for frequency and phase displacement measurement.