



Printed Pages : 4

EEE302

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

PAPER ID : 0209

Roll No.

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B.Tech

(SEM III) ODD SEMESTER THEORY EXAMINATION 2009-10  
ELECTRICAL MEAS. & MEASURING INSTRUMENTS

Time : 3 Hours]

[Total Marks : 100

Note : (1) Attempt all questions.

(2) All questions carry equal marks.

1 Answer any four parts of the following :  $5 \times 4 = 20$ 

(a) Enlist the differences between gross and systematic errors with suitable example.

(b) Two resistances  $R_1$  and  $R_2$  are connected in parallel with  $R_1 = 10 \text{ k}\Omega \pm 5\%$  and  $R_2 = 5 \text{ k}\Omega \pm 10\%$ . Calculate the percentage error and range of combined resistance.

(c) Explain the term "Standards" in measurement system. Also mention the various types of standards used in industry.

(d) An electrostatic voltmeter reading upto 1 kV is controlled by a spring with spring constant of  $1 \times 10^{-7} \text{ N-m/degree}$  and has a full scale deflection of  $80^\circ$ . The capacitance at zero voltage is  $1 \times 10^{-12} \text{ Farad}$ . What is the capacitance when the pointer indicates 1 kV?

- (e) Describe construction and working of electrodynamic type voltmeter.
- (f) An electrodynamic wattmeter has a pressure coil of resistance  $8\text{ k}\Omega$  and inductance of  $65\text{ mH}$ , which is connected directly across the load carrying current of  $8\text{ A}$  at voltage of  $230\text{ V}$ ,  $50\text{ Hz}$  and power factor of  $0.1$  lagging. Estimate the percentage error in wattmeter reading.

2 Attempt any **two** parts of the following :  $10 \times 2 = 20$

- (a) A current transformer of turn ratio  $1 : 200$  is rated as  $1000/5\text{ A}$ ,  $25\text{ VA}$ . The coreless and magnetizing component of the primary current are  $4\text{ A}$  and  $7.5\text{ A}$  under rated conditions. Determine the phase angle and ratio errors for the rate burden and rated secondary current at  $0.8\text{ pf}$  lagging and  $0.8\text{ pf}$  leading. Neglect the resistance and leakage reactance of secondary winding.
- (b) Explain construction and working of electro-mechanical type frequency meter. Enlist the merits and demerits of it from other frequency meter.
- (c) Draw an equivalent circuit and phasor diagram of potential transformer (PT). Derive the expression for its ratio and phase angle errors. How PT is used in extension of instrument range ?

3 Answer any **two** parts of the following :  $10 \times 2 = 20$

- (a) What are the problems associated with the measurement of low resistance and how are they overcome in Kelvin's double bridge ? Derive an expression for the unknown resistance in case of Kelvin's double bridge.

- (b) The four arms of Maxwell's capacitance bridge at balance are : arm AB, an unknown inductance  $L_1$ , having an inherent resistance  $R_1$ , arm BC, a non-inductive resistance of  $1000\text{ }\Omega$ , arm CD, a capacitor of  $0.5\text{ }\mu\text{f}$  in parallel with a resistance of  $1000\text{ }\Omega$ , arm DA, a resistance of  $1000\text{ }\Omega$ . Determine the value of  $R_1$  and  $L_1$ . Also derive the equations of balance for the bridge. Draw the phasor diagram of the bridge under balance conditions.
- (c) Describe the working of Schering's bridge for measurement of capacitance. Derive the equation for balance conditions and draw the phasor diagram under balance conditions.

4 Answer any **two** parts of the following :  $10 \times 2 = 20$

- (a) A ring specimen having a mean diameter of  $0.3\text{ meter}$  and a cross-sectional area  $400\text{ mm}^2$  has a primary winding of  $80$  turns wound uniformly. The secondary winding of  $30$  turns is connected to a flux meter having a constant of  $0.1 \times 10^{-4}\text{ Wb turn/division}$ . A deflection of  $40$  divisions is observed when a current of  $2\text{ A}$  is reversed in the primary winding. Calculate the relative permeability of iron specimen.
- (b) Explain the construction and principle of working of a coordinate a.c. potentiometer. Draw a diagram of scheme of connections of it and describe how ac potentiometer is standardized.

- (c) Describe the following with the help of suitable diagram :
- (i) Calibration of a.c. wattmeter
  - (ii) Hysteresis loop of magnetic specimen by method of reversals.

5 Answer any **three** parts of the following :  $6\frac{2}{3} \times 3 = 20$

- (a) Describe the construction and working of dual beam CRO using block diagram.
- (b) Describe the construction and working of power analyzer used in digital measurement.
- (c) A  $3\frac{1}{2}$  digit voltmeter is used for measuring voltage :
  - (i) Find the resolution of the meter.
  - (ii) How would a voltage of 15.45 V is displayed on 10 V scale ?
  - (iii) How would a voltage of 36.75 V is displayed on 100 V scale ?
- (d) With the help of circuit diagram, explain the functioning of a ramp type digital voltmeter.
- (e) Explain the various applications of CRO in management.

