B.E. (EE) Part-III 5th Semester Examination, 2007

Measurement - II

(EE-506)

Time : 3 hours **Full Marks : 100**

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Two marks are reserved for neatness in each half.

FIRST HALF

1. a) Explain the following with suitable examples:
   i) Gross errors
   ii) Systematic errors
   iii) Standard deviation

   b) The underdamped galvanometer was energized 100 times under the same carefully controlled experimental conditions and the maximum deflection was read in each case. The readings were normally distributed about a mean value of 26.3 mm and had a probable error of 2.5 mm. How many of 100 readings would you estimate exceeded 30 mm? [(3×3)+7]

2. a) Describe the constructional details and working of a single phase electrodynamometer type of power factor meter. Prove that the special displacement of moving system is equal to the phase angle of the system.

   b) In a deflectional frequency meter working on the principle of electrical resonance, there are two parallel circuits each consisting of an inductance and a capacitance in series. One circuit has $C_1 = 1\mu F$ and is tuned to a frequency , $f_1 = 60$ Hz. The other has $C_2 = 1.5\,\mu F$ and is tuned to a frequency f_2, below 50 Hz. The resistance of each circuit is $R_1 = R_2 = 100$ ohm. What must be the inductance of the second circuit, and to what frequency must it be tuned, in order that the current in both the circuits shall be same at a frequency of 50 Hz. (8+8)

3. a) Describe the construction and working of a Merz Price Maximum Demand Indicator.

b) Supposing the following readings are obtained for one month of 30 days, find out the average monthly load factor and power factor.
kVarh (reactive) meter advance = 83830, kWh meter indicator = 1400, Demand indicator = 1400 kW. **(8+8)**

4. a) Explain the instrinsic constants of a ballistic galvanometer and write down the equation for motion of a galvanometer. Explain the response of the galvanometer under (i) undamped conditions, (ii) underdamped conditions, (iii) critically damped conditions and (iv) overdamped conditions. Draw the response curves.

b) A manufacturer lists grain oriented steel sheet 0.3 mm thick. The resistivity of material is 50×10^{-8} ohm.m. The hysteresis loop is essentially rectangular in form, with a coercive force of 12 A/m at 100 Hz is used. The density of material is 7650 kg/m^3. Find the total loss/kg. **(10+6)**

5. a) Explain the construction and working of an average reading VTVM. Describe its advantages and disadvantages. Explain how this meter can be converted to a rms reading voltmeter.

b) Explain the functioning of a basic type of strip chart recorder. Explain the different types of marking mechanisms used in it. **(8+8)**

SECOND HALF

6. a) Explain the method of construction of hysteresis loop by the method of reversals using Ballistic Galvanometer.

b) Write a brief notes on types of errors and. **(8+8)**

7. a) Write a brief note on fluorescence material used in CRO.

b) Derive the expression for determining the phase angle difference of two signal using CRO.

c) Draw the lissajous patterns for the following conditions.

i) Both signals have same frequency with 78-degree phase difference.

ii) Frequency ratio is 5/3 **(4+8+4)**

8. a) "DC potentiometer cannot be used to measure an AC quantity straight way"– justify the statement and describe a method for measuring AC potential.

b) Explain "standardization" of potentiometer with suitable diagram. **(10+6)**

9. a) Show that for AC bridges, the ratio of R1-R2, R3-R4 and L1-L2 are equal with suitable diagram, Where Rn and Ln are as per convention.

b) For a Maxwell's bridge, R3 and R4 are non-reactive resistors of 100 ohm each. Z1 is standard variable inductor L of resistance 32.7 ohm and Z2 comprises a standard variable resistor R in series with a coil of unknown impedance. Balance is obtained when L = 47.8 mH and R = 1.36 ohm. Derive the full expression of Maxwell's bridge and find the resistance and reactance of the coil. **(6+10)**

10. Write short notes : **(4×4)**

a) Measurement of B-H loops using CRO

b) Synchroscope

c) Grossot flux meter

d) Measurement of iron-loss by self inductance method.

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