[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2064)

14671

B. Tech 4th Semester Examination

Electrical Measurements & Measuring Instruments (O.S.)

EE-4005

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Question Paper consists of five sections A, B, C, D & E. Section E is compulsory. Attempt five questions in all selecting one question from each of the sections A, B, C & D and all the subparts of the question in section E. Use of non-programmable calculator is allowed.

SECTION - A

1. (a) What are different types of errors common to measurements? Describe in detail.

   (b) Give a detailed description of different types of forces commonly needed for satisfactory operation of electromechanical indicating instruments. (10+10=20)

2. (a) What do you understand by gravity control and spring control essentially used in measuring instruments? Explain in detail with the help of suitable diagram.

   (b) What do you understand by absolute standards? What is their importance? Give broad classification of these standards. (10+10=20)

SECTION - B

3. (a) Discuss the working principle of moving iron type instruments. Derive general torque equation for these instruments.

   (b) In case of an moving iron ammeter, the range of the instrument is to be extended from 0-10 A to 0-75 A by using a shunt. The resistance and inductance associated with the instrument are 0.1 Ω and 60 μH, respectively. Calculate the constants of shunt required for this extension. If the shunt is made non-inductive and the combination reads correctly on d.c., find out the full scale error at frequency 50 Hz. (10+10=20)

4. (a) Explain the method of extending the range of moving iron instruments using multipliers.

   (b) What are electrostatic instruments? Derive force and torque equations of electrostatic instruments. (10+10=20)

SECTION - C

5. (a) Explain in detail the theory of electrodynamometer wattmeter. What are the common errors in these wattmeters?

   (b) Describe light load, over-load, voltage and temperature compensation schemes in case of single phase induction type energy meters. (10+10=20)

6. (a) Explain the working of electro-resonance type frequency meters. Draw and explain the phasor diagrams under different power factor conditions.

   (b) Explain the constructional details and working of single phase electrodynamometer power factor meter. (10+10=20)

SECTION - D

7. (a) Explain Kelvin double bridge method of measurement of low resistances. Also derive the bridge balance condition for Kelvin double bridge method.

   (b) Explain Hay's bridge for measuring unknown inductance. Give its advantages and disadvantages over the Maxwell's inductance capacitance bridge. (10+10=20)

8. (a) The four arms of a bridge are given as follows:

   Arm AB: an imperfect capacitor C_1 with an equivalent series resistance of r_1 ohm.

   Arm BC: a non-inductive resistance R_3.

   Arm CD: a non-inductive resistance R_4.

   Arm DA: an imperfect capacitor C_2 with an equivalent series resistance of r_2 in series with a resistance R_2.

   A supply of 450 Hz is given between terminals A & C and the detector is connected between B & D. At balance condition $R_2 = 4.8\ \Omega$, $R_3 = 2000\ \Omega$, $R_4 = 2850\ \Omega$, $C_2 = 0.5\mu F$ and $r_2 = 0.4\ \Omega$. Calculate the value of C_1 and r_1 and also the dissipating factor of this capacitor.

   (b) What is a Megger? Give detailed description of construction and its principle of operation with the help of suitable diagram. (10+10=20)

SECTION - E

9. (a) Resistance of a circuit is measured by observing the current flowing and power fed into the circuit. The limiting errors in measurement of power and current are ±1.5% and ±2.5% , respectively. Find out limiting error in the measurement of resistance.

(b) Compare recording and indicating type instruments.

(c) Distinguish between primary and secondary standards.

(d) What are the general requirements for a material to be used for shunts and multipliers?

(e) What is the necessity of using shunt and series magnets in case of single phase induction type energy meters?

(f) What do you understand by phantom loading?

(g) What are the disadvantages of moving iron type power factor meters?

(h) What do you understand by Wagner earth device? Explain in brief.

(i) Why does De Sauty's bridge give poor results for dissipation factor measurement?

(j) What is the role of shading bands in case of single phase induction type energy meters? (10×2=20)