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RN-6811

B. E. III (Sem. V) (Electrical) Examination

May / June – 2010

Electrical Measurement & Instruments - I

Time : **3** Hours] [Total Marks : **100**

Instruction :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 3 (Sem. 5) (Electrical)**

Name of the Subject :

☛ **Electrical Measurement & Instruments - 1**

☛Subject Code No. : **6 8 1 1** ☛Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answer to the **two** section must be written in **separate** answer books.
(3) Attempt all questions.
(4) Draw figure wherever necessary.
(5) Be brief in description
(6) Figures to right indicate marks.

SECTION - I

1 (a) Do as directed : **10**

(i) The full scale current of a basic D'Arsonval galvanometer is 1 mA. Its sensitivity is _____ Ω/V.

(ii) In case of ballistic galvanometer, time period should be _____.

(iii) A megger, when not in operation indicates a resistance of _____.

(iv) The most suitable method for measuring the resistance of the elements of an attenuator is _____.

(v) The most commonly used null detector in ac bridge measurement is _____.

(vi) Hay's bridge is used for measurement of low Q-coils. True/false.

(vii) In measurement of resistance by Carey foster bridge error is introduced due to thermoelectric emf. True/false.

(viii) Wein bridge is designed to measure frequency. True/false

(ix) For measuring an ac voltage by an ac potentiometer, it is desirable that the supply for potentiometer is taken from a battery. True/False

(x) The potentiometer is standardized for making it accurate. True/False

(b) What is volt ratio box? Explain with diagram. **5**

(c) Describe the type of errors occurs in bridge measurement. How these errors can be eliminated? **5**

2 (a) The **four** arms of a bridge are : **10**

Arm ab : an imperfect capacitor C1 with an equivalent series resistance r1.

Arm bc : an non-inductive resistance R3

Arm cd : a non-inductive resistance R4

arm da : an imperfect capacitor c2 with an equivalent resistance r2 in series with a resistance R2.

A supply of 450 Hz is given between terminal a and c and a detector is connected between b and d.

At Balance R1 = 5 Ω, R3 - 2,000 Ω, R4 - 2,950 Ω, C2 = 0.5 μ F and r2 = 0.4 Ω. Calculate the value of C1 and r1. Also dissipation factor of capacitor. Derive the formula used.

(b) Explain surface and volume resistivity with suitable diagram. **5**

OR

2 (a) Describe Carey foster slide wire bridge method for measurement of medium resistance. **8**

(b) Explain working principle of D'Arsonval galvanometer. **7**

3 Attempt any **three** : **15**

(a) Explain Cromption potentiometer with diagram

(b) Explain basic principle and working of Ballistic galvanometer

(c) Brooks deflection potentiometer.

(d) Megger.

SECTION - II

4 (a) Answer the following questions : **10**

(i) What is meant by meter constant of an energy meter?

(ii) What type of daming is used in PMMC instruments?

(iii) Why eddy current damping is not possible in moving iron instruments?

(iv) Explain why ac power cannot be measured by ammeter and voltmeter.

(v) Define "Burden" of CT.

(vi) Write the equation of the correction factor in dynamometer type wattmeter.

(vii) What is phase angle error of PT?

(viii) What is meant by ammeter shunt?

(ix) Why is the graduation of scale of PMMC instrument uniform throughout?

(x) What if controlling torque is absent in instrument?

(b) Write a short note on PT. **7**

(c) Explain energy meter. **8**

OR

(b) Write a short note on errors in both DC and AC measurements. **8**

(c) Derive the general torque equation for a moving iron type instruments. The inductance of a moving iron ammeter is given by following expression. **7**

$L = (20 + 10\theta - 2\theta^2)$ μH.

where θ is deflection in radians. The spring constant is 24×10^{-6} Nm/rod. Calculate the values of deflections for a current of 5A.

5 (a) Explain dynamometer type of instruments. **5**

(b) Explain attraction type of moving iron instrument and derive its torque equation. **5**

OR

5 State the errors in dynamometer type wattmeter and derive the expression of error due to inductance of pressure coil. **10**

6 Attempt any **three** : **15**

(i) Different methods of damping.

(ii) Vibrating reed type frequency meter.

(iii) Explain compensation method for light loads in energy meter and also explain creeping.

(iv) Explain difference between the scales of MI and PMMC instrument and also difference in principle of working.

(v) Draw the phasor diagram of CT and explain.
