Form A: Paper-setting Blank

Ref. No. Ex/PE/T/314/60/2012

BACHELOR OF POWER ENGG. EXAMINATION, 2012
(3rd YEAR, 1st SEM.)
SUBJECT: Elect. Meas. & Instrumentation
Part-I

Time: Three Hours **(2 marks allotted for neatness)** **Full Marks 50**

Answer any THREE questions

No. of Questions		Marks
1.a)	Define: Accuracy, precision, sensitivity, loading effect, hysteresis effect.	(5×2)=10
b)	Differentiate among different torques are activated for operation of electrical measuring instruments.	6
2.a)	Derive the governing equation of Dynamometer type wattmeter with a neat figure.	8
b)	The spring constant of a 15 A Dynamometer wattmeter is 11.5×10^{-6}N-m per radian. The variation of mutual inductance with angular position of moving system is practically linear over the operating range; the rate of change is being 0.085 mH per radian. If full scale deflection of instrument is 85 degrees, calculate the current required in voltage coil at full scale on d.c circuit. (Assume $T_d=I_1I_2dM/d\theta$ N-m).	8
3.a)	State the errors of rectifier type voltmeter & their compensation techniques.	6
b)	State the advantages & limitations of electrostatic voltmeter.	4
c)	The reading 150 volt of a 200 volt electrostatic voltmeter is to represent 15,000 volts when its range is extended by the use of a capacitor in series. If the capacitance of the voltmeter at the above reading is 90 μμF, find the capacitance of the capacitor multiplier required.	6
4.a)	Draw neat circuit diagrams of induction type voltmeter, ammeter & wattmeter showing basic components.	(3×2)=6
b)	From the basic deflecting torque expression of induction type instrument comment on maximum torque.	4
c)	What are the sources of errors of Induction type wattmeter & how can you rectify those errors?	3+3=6
5.a)	State the operating principle of type Moving Iron frequency meter with a neat figure.	8
b)	State the working principle of Electrodynamic Power factor meter with a neat figure.	8

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Bachelor of Power Engineering 3rd Year, 1st Semester Examination, 2012

Electrical Measurement and Instrumentation

(50 marks for each part)
Use separate Answer-Script for each part

Time: Three Hours | Full Marks: 100

Part – II

Answer any *three* questions
(2 marks for neatness)

1. (a)Describe the principle of operation of moving coil vibration galvanometer. 4

   (b) Explain, how the amplitude of vibration of the same can be made large? 3

   (c) The coil of a moving coil galvanometer is wound on a non-magnetic former whose height and width are both 2 cm. It moves in a constant field of 0.12 Wb/m^2. The moment of inertia of its moving parts is 0.25×10^{-6} $kg\text{-}m^2$ and the control spring constant is 30×10^{-6} Nm/rad. Calculate (i) the number of turns that must be wound on the coil to produce the deflection of 150° with a current of 10 mA and (ii) the resistance of the coil to produce critical damping, all damping assumed to be electromagnetic. 9

2. A ring core current transformer with a nominal ratio of 500/5 and a bar primary has secondary resistance of 0.5 Ω and a negligible secondary reactance. The resultant of magnetizing and iron loss components of the primary current associated with full load secondary current of 5Ain a non-inductive burden of 1.0 Ω is 3 A at a power factor of 0.4. Calculate the true ratio and phase angle error of the CT on full load. Calculate also the total flux in the core assuming a frequency of 50 Hz. Derive the equations used to solve the problem. 16

3. (a) How the unknown inductances are measured using Anderson's bridge. What are the advantages of this bridge over the Maxwell's bridge? 6

   (b)A Schering bridge is used for measuring power loss in dielectrics. The specimens are in the form of 0.3 cm thick and have a dielectric constant of 2.3. The area of each electrode is 314 cm^2 and the loss angle is known to be 9 for a frequency of 50 Hz. The fixed resistor is of 1000 Ω and the fixed capacitor is 50 pF. Determine the value of variable capacitor and resistor. . 10

4. (a) Describe the method of calibrating a Wattmeter using Potentiometer. 6

   (b)Four arms of a Wheatstone bridge are as follows:
   $AB = 100\ \Omega$, $BC = 1000\ \Omega$, $CD = 4000\ \Omega$, and $DA = 400\ \Omega$.
   The galvanometer has a resistance of 100 Ω, a sensitivity of 100 mm/μA and is connected across *AC*. A source of 4 V DC is connected across BD. Calculate the current through the galvanometer and its deflection if the resistance of the arm *DA* is changed from 400 Ω to 401 Ω. 10

5. Write short notes on any two of the following: 2×8

   (i) Measurement of low resistance.
   (ii) Sensitivity calculation of Galvanometer.
   (iii) Co-ordinate type AC potentiometer.
   (iv) Determination of *B-H* curves and hysteresis loops in ferromagnetic ring specimen using Ballistic method.