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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2012

ELECTRICAL & ELECTRONICS ENGINEERING

Third Semester

EE 9203 Measurements and Instrumentation

(Regulation 2008)

Time : 3 Hours Answer ALL Questions Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What is an LVDT? State its principle of operation?
2. Distinguish between accuracy and precision?
3. What is special about 'Saturated Weston cell'?
4. A piezo-electric crystal has a voltage sensitivity of 0.1 Vm/N. Its thickness is 2 mm. Evaluate the voltage that it would develop, when a pressure of 2 MN/m^2 is applied?
5. What is the purpose for drilling two diametrically opposite holes at the periphery of the aluminum disc used in an energy meter? How does this help?
6. What is a 'swamping resistance'? Where is it used?
7. Draw the circuit diagram of a megohm bridge?
8. What do you understand by 'transfer instrument'? Give an example.
9. How does an electromagnetic flow meter operate?
10. Distinguish between an a.c. tachometer and a d.c. tachometer?

Part – B (5 x 16 = 80 marks)

11. Discuss briefly the constructional features of an electro-dynamometer type watt meter. How is its scale made uniform over a large range? Derive an expression for the correction factor due to the pressure coil inductance? How does this expression get modified considering phase angle errors of the Current Transformer and the Potential Transformer used for measuring power in a high voltage power system? You may assume lagging power factor case. The indication on a 110V, 5A wattmeter used in conjunction with potential and current transformers of nominal ratios of 100/1 and 20/1 respectively, is 365W. If the resistance and inductance of the pressure coil are 300Ω and 20 mH, and the ratio and phase angle errors of the potential and current transformers at the operating conditions are: +0.75%, -0.6^{O} and -0.25% , $+1.25^{O}$, what is the true value of the power being measured? The load phase angle is 40^{O} lagging, and the frequency is 50 Hz.

12. a) Given two concentric cylindrical metal tubes (inner cylinder having an outer radius of 'r' and the outer cylinder having an inner radius of 'R'), suggest a scheme for level measurement of a non-conducting liquid employing the concept of capacitive transducer. Ignoring edge effects, show that the change in capacitance is proportional to the change in liquid level? Also explain how a 'Schering's bridge' is useful for measurement of the capacitance? Under balance conditions, derive an expression for the capacitance measured.