USN | | | | | | | | | | |

IT35

# Third Semester B.E. Degree Examination, June / July 08
## Electrical and Electronics Measurements

Time: 3 hrs. Max. Marks:100

**Note :** ***Answer any FIVE full questions.***

1 a. Derive the dimensional equations for pole strength current, emf, magnetic flux, magnetic flux density, mmt magnetizing force, reluctance, permeance in the e. m. system of units. **(08 Marks)**

b. Show that the product $\frac{1}{\sqrt{\mu\varepsilon}}$ has the dimensions of velocity, where $\mu$ = permeability and $\varepsilon$ = permittivity. **(06 Marks)**

c. Discuss the methods of measurement of Earth resistance. **(06 Marks)**

2 a. What are the different factors which affect the precision measurement of medium resistances with Wheatstone bridge? Explain how their effects are minimized. **(08 Marks)**

b. A Wheatstone bridge is used for measuring the value of change of resistance of a strain gage which forms one of arms of the bridge. All the arms of the bridge including the strain gauge have a resistance of 100 Ω each. The maximum allowable power dissipation from the strain gage is 250 mW. Determine the value of maximum permissible current through the strain gage and maximum allowable value of bridge supply voltage. Suppose a source of 20 volts is available, find the value of series resistance to be connected between the source and the bridge to limit the input voltage of the bridge to permissible level. **(04 Marks)**

c. Describe the sources and the null detectors that used for a. c. bridges. **(08 Marks)**

3 a. Derive equations of balance for an Anderson's bridge. Draw the phasor diagram for conditions under balance. Discuss the advantages and disadvantages of the bridge. **(08 Marks)**

b. Describe the functional details of a single phase induction type energy meter. Explain why the phase of shunt flux is made exactly in quadrature with that of applied voltage so as to produce a deflecting torque exactly proportional to power. **(08 Marks)**

c. The exciting current of a ring core current transformer of ratio 1000/5 A, when operating at full primary current and with a secondary burden of non - inductive resistance of 1 Ω is 1 A at a power factor of 0.4. Calculate i) the phase displacement between primary and secondary winding currents ii) the ratio error at full load, assuming there has been no compensation. **(04 Marks)**

4 a. Describe the constructional details of an electrodynamometer type wattmeter. Derive the expression for torque when the instrument is used on a. c. Explain why it is necessary to make the potential coil circuit purely resistive. **(08 Marks)**

b. An energy meter is designed to make 100 revolutions of disc for one unit of energy. Calculate the number of revolutions made by it when connected to load carrying 40 A at 230 V and 0.4 power factor for an hour. If it actually makes 360 revolutions find the percentage error. **(06 Marks)**

c. Explain the sources of errors in single phase induction type energy meters. **(06 Marks)**

5 a. With the help of a circuit diagram explain, for the Q – measurement of a high impedance component in the parallel connection. **(08 Marks)**

b. Compute the value of self – capacitance of a coil when the following measurements are made : At frequency f = 2MHz, the tuning capacitor is set at 450 pF. When the frequency is increased to 5 MHz, the tuning capacitor is tuned at 60 pF. **(04 Marks)**

c. Explain with typical metering circuit of a solid – state electronic multimeter. **(08 Marks)**

6 a. Explain with the help of a neat circuit diagram the working of dual slope DVM. **(08 Marks)**

b. Define resolution, sensitivity and quantizing error in successive approximation type digital voltmeter. **(06 Marks)**

c. Discuss the advantages of a successive approximation register type DVM over other of DVM. **(06 Marks)**

7 a. Derive an expression for a gage factor of a metallic strain gage. **(08 Marks)**

b. A resistance strain gage with a gage factor of 2 is fastened to a steel member subjected to a stress of 1050 kg /cm$^2$. The modulus of elasticity of steel is approximately $2.1 \times 10^6$ kg /cm$^2$. Calculate the change in resistance, $\Delta R$ of the strain – gage element due to applied stress. **(04 Marks)**

c. With neat sketches explain different types of gage configurations. **(08 Marks)**

8 a. Explain with a schematic representation of an open – collector IEEE – 488 bus transceiver. **(08 Marks)**

b. Discuss with the block diagram of auto ranging power meter used in fiber – optic power measurement. **(08 Marks)**

c. How much loss will be experienced if a fiber of numerical aperture of 0.3 is the source for a fiber with a numerical aperture of 0.242? **(04 Marks)**