



III B.Tech. I Semester Regular Examinations, November/December - 2012 ELECTRICAL MEASUREMENTS

(Electrical and Electronics Engineering)

Time: 3 Hours

Code No: R31022

Max Marks: 75

Answer any FIVE Questions All Questions carry equal marks *****

- 1. Describe the constructional details and working of a moving iron Repulsion type meter. Derive its Torque equation
- 2. (a) Explain the use of instrument transformers. What are their advantages over the shunt and multipliers?
 (b) A single turn 1,000/5A, 50 Hz, current transformer has a non-inductive burden of 1Ω. The magnetizing current is 100 A. Calculate the current ration and Phase Angle.
- 3. Explain the construction and principle of operation of a dynamometer type wattmeter. How it can be made to read dc as well as ac?
- 4. Explain the principle of a rectangular type co-ordinate A.C.Potentiometer.Draw a diagram of scheme of connections and describe how the potentiometer is standardized.
- 5. What are the problems associated with measurement of low resistances? How are they overcome through use of Kelvin's double bridge? Derive the expression for the unknown resistance.
- 6. A balanced 1 KHz bridge has the following configuration: Arm AB: R₁ = 1000Ω in parallel with C₁ = 0.053μF Arm BC: R₂ = 1500Ω in series with C₂ = 0.53μF Arm CD: the unknown Arm DA: Pure capacitance C₄= 0.265 μF. Determine R and L or C constants of the unknown. Draw the phasor diagram of the bridge at above frequency.
- 7. Explain with the help of a neat diagram, a method for the determination of B-H Curve of a magnetic sample. Point out various sources of errors and methods of minimizing them.
- 8. Explain the principle of operation of a successive approximation type of Digital voltmeter with a neat block diagram.



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- (a) Discuss briefly the essential features of indicating instruments.
 (b) Explain with a neat sketch the construction and operation of a D'Arsonval galvanometer
- 2. Derive expressions for the Ratio and Phase angle errors of a current Transformer with a neat phasor diagram.
- 3. (a)Show that in a two wattmeter method of a 3-phase power measurement the sum of the readings of the two wattmeter's gives the total power consumed in a 3-phase -w1-w2

circuit. Hence prove
$$Tan \varphi = \sqrt{3} \frac{w^{1-w^{2}}}{w^{1+w^{2}}}$$

Where φ is the phase angle of the load and w1 and w2 are the readings of the wattmeters.

(b) A balanced load is supplied from a $3-\varphi$, 400V, 3-wire system whose power is measured by two wattmeter's. If the total power supplied is 26KW at 0.75 power factor lagging, find the readings of the each of the two wattmeters.

- 4. Explain the construction and working of a polar type Potentiometer. Explain the method for standardizing it.
- 5. (a) What are the problems associated with the measurement of high resistances.
 (b) A length of cable is tested for insulation resistance by the Loss of charge method. A voltmeter of infinite resistance is connected between the cable conductor and earth, forming there with a joint capacitance of 800 pF. It is observed that the voltage falls from 250 V to 85 V in 60 Seconds. Calculate the insulation resistance of the cable.
- 6. Explain how the self inductance can be measured by using Anderson bridge and deduce the equations when the bridge is under balanced condition .Draw the phasor diagram of the voltages and currents of the bridge arms at balance.
- 7. Explain the constructional features of a flux meter. Show that for a flux meter $N \phi = K (\theta_2 \theta_1)$ Where N is the number of turns on the search coil used, ϕ is change in flux, θ_1 is the initial reading in the flux meter and θ_2 is the final reading in the flux meter and K is a constant.
- 8. Explain the principle of operation of an Integrating type of Digital voltmeter with a neat block diagram.

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- 1. Describe the construction and working of a PMMC type of instrument. Derive the expression for deflection for a PMMC ammeter if it is (i) Spring controlled and (ii) Gravity controlled. Comment up on the shape of scale in both cases.
- 2. (a) How does a current transformer differ from an ordinary power transformer.
 (b) What will happen if the secondary circuit of a CT is accidently opened while the primary is carrying current.
 (c) Explain the meaning of the term "Burden" in the instrument transformer.
- 3. Explain the construction and working of a single phase induction type energy meter. Show that the total number of revolutions made by its disc during a particular time is proportional to the energy consumed.
- 4. Explain with the help of suitable diagrams, how a D.C.Potentiometer can be used for:
 (i) Calibration of Voltmeter (ii) Calibration of an Ammeter
 (iii) Calibration of Wattmeter (iv) Determination of an unknown Resistance.
- 5. Describe with the help of diagram the loss of charge method for determining the insulation resistance of a length of a cable.
- 6. A dielectric sheet of thickness 1mm is tested at 50 Hz between two electrodes of 10 cm diameter. The Schering bridge is employed has a standard compressed air capacitor C_3 of 100 pF; a non-inductive resistor R_4 of 350 Ω in parallel with a variable capacitor C_4 and a non-inductive variable resistor R_2 . At balance $C_4 = 0.4\mu$ F, $R_2 = 250\Omega$.Calculate power factor and permittivity of the sheet.
- 7. Explain the "method of reversals" and step- by-step method for determination of B-H curve of specimens
- 8. Explain the principle of operation of a Dual slope type of Digital voltmeter with a neat block diagram.



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- 1. Describe with suitable diagrams the two forms of moving –iron type instruments. Derive expression for the deflecting torque and show this type of meter reads rms values for ac quantities.
- 2. How is the power factor of a single- phase circuit measured? Describe the working principle of an electrodynamic type power factor meter with the help of a suitable diagram.
- 3. (a) What is phantom loading ? Explain with an example how it is more advantageous than testing with direct loading.(b) Explain the construction and working of a Merz Price maximum demand indicator.
- 4. (a) Explain with the help of neat diagram the principle and working of any one form of D.C potentiometer. Explain how this potentiometer is standardized.
 (b) An Energy meter, whose constant is 600 revolutions per KWH, makes 5 revolutions in 20 seconds. Calculate the load in KW.
- 5. The insulation resistance of 2 meter cable was measured by the loss of charge method. The voltage across the standard capacitor of 0.003 μ F from 222 V to 155 V in one minute. Calculate the insulation resistance of the cable. Derive the formula used. What will be the insulation resistance if the length of the cable is doubled?
- 6. (a) What are the advantages and disadvantages of a Maxwell bridge(b) Explain how capacitance can be measured by the use of a Schering bridge with a neat diagram and further derive the unknown capacitance at balance.
- 7. Explain the "Lloyd Fisher square "method of measuring iron losses in ferromagnetic material.
- 8. Write short notes on the following:i) Digital Tachometer ii) Digital multimeter
