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Code No: V3109 **R07** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ELECTRICAL MEASUREMENTS

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. Describe the constructional details and principle of operation of a D'Arsonval galvanometer. Derive the expression for steady state deflection. [16M]

2. (a) Define the following terms as applied to instrument transformers:
   i) Burden of an instrument transformer ii) Turns Ratio
   iii) Actual Transformation ratio iv) Nominal transformation Ratio
   (b) A current transformer with a nominal ratio of 1,000/5 amperes has a bar-primary. The magnetizing and iron –loss components are each 1.5% of the full load primary current. Determine the ratio and phase angle errors when the secondary carries a current of 5A lagging behind the secondary induced voltage by 30^{o}. [8M+8M]

3. Show that in a two wattmeter method of a 3-phase power measurement the sum of the readings of the two wattmeters gives the total power consumed in a 3-phase circuit. Hence prove
$$Tan\varphi = \sqrt{3}\,\frac{w1 - w2}{w1 + w2}$$
   Where φ is the phase angle of the load and w1 and w2 are the readings of the wattmeters. [16M]

4. 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. [16M]

5. (a) Describe the term " standardization of potentiometer". Describe the procedure of standardization of a dc potentiometer.
   (b) The current taken by a small iron core choke coil is measured by a rectangular co-ordinate potentiometer. A 1.0Ω non –inductive resistance is connected in series with the choke coil. The voltage measured across the resistance and the coil are (0.8-j0.75) Volt and (1.2+ J0.3) V respectively. Assuming sinusoidal voltage and current, determine the core loss in the coil. [8M+8M]

6. Describe with the help of neat diagram, the loss of charge method to determine the insulation resistance of a short length of cable and derive an expression for determination of insulation resistance. [16M]

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7. (a) Explain with the help of circuit and phasor diagrams the Anderson bridge method for the measurement of inductance.
   (b) The four arms of a Maxwell bridge are arranged as follows: AB and BC are non-reactive resistances of 250Ω each, DA is a standard variable reactor L of resistance 35.2Ω and CD comprises a standard variable resistor R in series with a coil of unknown impedance. Balance is obtained when L= 25.6mH and R = 2.5Ω.Find the resistance and inductance of the coil. [8M+8M]

8. Derive the expression for the deflection of ballistic galvanometer in terms of its physical constants. Explain these constants. [16M]

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Code No: V3109 **R07** **Set No: 2**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ELECTRICAL MEASUREMENTS

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. Describe the constructional details and working of a moving iron attraction type meter. Derive its Torque equation [16M]

2. Derive the expressions for Actual transformation (voltage) ratio, ratio error and phase angle error with a neat phasor diagram [16M]

3. (a) Discuss the various types of errors and their methods of compensation in the dynamometer type wattmeter's. [8M]
   (b) The power to a 3-phase induction motor was measured by two wattmeter method, and the readings were 3,400 and -1200 watts respectively. Calculate the total power and power factor. [8M]

4. Derive the expression for torque of a single phase induction type of energy meter. Explain that this meter can measure the true energy consumed only if the phase angle between the applied voltage and the pressure coil flux is 90^0.Describe a method for making this adjustment. [16M]

5. Explain the construction and working of a polar type ac potentiometer. Explain the method for standardizing it. [16M]

6. (a) Explain the procedure of measuring a low resistance with the help of Kelvin's double Bridge . Derive the relation for finding the unknown Resistance.
   (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 600 pF.It is observed that the voltage falls from 250 V to 92 V in 60 Seconds. Calculate the insulation resistance of the cable. [8M+8M]

7. Explain the working principle of Schering bridge and derive an expression for measurement of unknown capacitor. Draw the phasor diagram under null condition and explain how the dissipation factor of the capacitor can be calculated [16M]

8. Write short notes on the following:
   i) Flux meter ii) Ballistic test on Ring specimen [16M]

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Code No: V3109 **R07** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ELECTRICAL MEASUREMENTS

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. Explain the construction of a PMMC meter with the help of a neat sketch. Derive the Torque Equation and further enlist the advantages and dis- advantages of PMMC meters [16M]

2. (a) How does a Potential transformer differ from a power transformer .
(b) Explain and describe the principle, construction and working of a Weston frequency meter with the help of a neat diagram. [6M+10M]

3. Explain the constructional details and working of a single phase electro-dynamometer type of wattmeter. Derive the expression for deflection for ac operation if the instrument is spring controlled [16M]

4. (a) what is meant by "Creeping" in an energy meter ? How is this prevented?
(b) The number of revolutions per KWH for a 230 V, 10 A watt-hour meter is 900.On test at half full load the time for 20 revolutions is found to be 69 Seconds. Determine meter error at half load. [6M+ 10M]

5. Explain the principle of working of Gall Tinsley AC Potentiometer with a neat connection diagram. [16M]

6. (a) Explain the importance of guard circuit in the measurement of High resistances.
(b) Explain with a neat diagram of a megohm bridge method for the measurement of High resistances [8M+8M]

7. Explain Heaviside Campbell equal ratio bridge with a neat connection diagram and describe how you can measure the resistance and inductance of a given coil directly from the bridge. [16M]

8. Explain the constructional features of a flux meter. Show that for a flux meter
$N\varphi = K(\theta_2 - \theta_1)$
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. [16M]

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Code No: V3109 **R07** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ELECTRICAL MEASUREMENTS

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. Derive an expression for the force of attraction between the plates in a parallel plate Electrostatic Voltmeter. [16M]

2. What is synchroscope? Explain the construction and working principle of any one type of synchroscope. How it is used to synchronise two 3-phase alternators? [16M]

3. Deduce an expression for the power factor of a balanced three phase load with the help of two wattmeter readings. What will be the power factors?
   (a) When the readings of the two wattmeters are equal
   (b) When the reading of one of the wattmeter is zero
   (c) When the readings of the two wattmeters are equal and opposite. [16M]

4. (a) What is the purpose of providing copper shaded bands on the central limb of the upper electromagnet in an energy meter
   (b) What is meant by creeping in an energy meter? How is it prevented?
   (c) Why does the rotating disc of an induction type energy meter carry a small hole? [6M+6M+ 4M]

5. (a) Summarize the advantages and limitations of AC Potentiometers.
   (b) Calculate the inductance of a coil from the following measurements on an ac potentiometer. Voltage drop across a 0.3Ω standard resistor connected in series with the coil is $0.612\angle 12^0\ 6^1$ V. Voltage across the test coil through 100/1 Volt –ratio box is $0.781\angle 50^0\ 48^1$ Volt. Frequency of supply is 50 Hz. [8M+8M]

6. Explain the carey-Foster's slide wire bridge for the measurement of medium resistances with a neat diagram and further compare its advantages over Wheatstone bridge. [16M]

7. A sample of Bakelite was tested by the Schering bridge method at 25 KV, 50 Hz. Balance was obtained with a standard condenser of 109 pF capacitance, a condenser of capacitance 0.5μF in parallel with a non-reactive resistor of 309Ω and a non-reactive resistor of 100Ω. Determine the equivalent series resistance and the power factor of the specimen. [16M]

8. Write short notes on the following:
   (a) Various methods for measuring iron losses
   (b) Ballistic galvanometer [16M]

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