Code No: R05310202 **Set No. 1**

III B.Tech I Semester Regular Examinations, November 2008
ELECTRICAL MEASUREMENTS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Give the classification of electrical measuring Instruments.
   (b) Explain the working principle of PMMC instrument with a neat sketch.
   (c) State the advantages and dis-advantages of PMMC instrument. [5+6+5]

2. Draw the equivalent circuit and phasor diagram of a potential transformer. Derive the expressions for its ratio error. State the assumptions made for derivation of this error. [16]

3. (a) Give the constructional details of electrodynamometer type wattmeter with a neat sketch.
   (b) Prove that the true power= $\frac{COS\phi}{COS\phi.COS(\phi-\beta)}\times$ Actual wattmeter reading for electrodynamometer type of wattmeters, where cosϕ =p.f of the circuit, $\beta = \tan^{-1}\left(\frac{wL}{R}\right)$ where L and R are the inductance and resistance of the pressure coil of the circuit. [8+8]

4. Derive the expression for deflecting torque in single phase induction type Energy water. Show that deflection is maximum when the phase angle between two fluxes is 90^0 and when the disc is purely non-inductive. [16]

5. (a) How a co-ordinate type A.C. potentiometer is standardized? Explain how an unknown voltage can be measured by using this potentiometer?
   (b) What are the sources of errors in the above potentiometer? [10+6]

6. (a) What are the different difficulties encountered in the measurement of high resistances? Explain how these difficulties are overcome?
   (b) A highly sensitive galvanometer can detect a current as low 0.1 nano-Amperes. This galvanometer is used in a wheat-stone bridge as a detector. The resistance of galvanometer is negligible. Each arm of the bridge has a resistance of 1KΩ. The input voltage applied to the bridge is 20V. Calculate the smallest change in resistance, which can be detected. The resistance of the galvanometer can be neglected as compared with the internal resistance of bridge. [10+6]

7. (a) State the advantages and disadvantages of Anderson's bridge.
   (b) Draw the phasor diagram for Anderson's bridge under balance conditions.
   (c) A bridge consists of the following:
   Arm ab - a choke coil having a resistance R_1 and inductance L_1
   Arm bc - a non-inductive resistance R_3.

Arm cd - a mica condenser C_4 in series with a non-inductive resistance R_4.
Arm da - non-inductive resistance R_2.
When this bridge is fed from a source of 500 Hz, balance is obtained under following conditions.
R_2=2410Ω; R . 3=750Ω; C . 4=0.35 μF ; R_4 = 64.5Ω. The series resistance of capacitor is 0.4Ω. Calculate the resistance and inductance of the choke coil. The supply is connected between a and c and the detector is between b and d. [6+4+6]

8. Explain the construction and working principle of a ballistic galvanometer with a neat sketch. [16]

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Code No: R05310202 **Set No. 2**

III B.Tech I Semester Regular Examinations, November 2008
ELECTRICAL MEASUREMENTS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the constructional details of PMMC instrument with neat sketch.
   (b) Explain why PMMC instruments are the most widely used instruments? Explain their advantages and disadvantages. [8+8]

2. (a) Explain the constructional details of different types of current transformers.
   (b) A 100/5A, 50 Hz current transformer has a bar primary and a rated secondary burden of 12.5VA. The secondary winding has 196 turns and a leakage inductance of 0.96mH. With a purely resistive burden at rated full load, the magnetizing mmf is 16AT and the loss excitation required 12A. Find ratio and phase angle errors. [8+8]

3. (a) Explain the working of a 3-phase wattmeter. Draw a neat sketch of the wattmerter and also its connections. Also, explain how the mutual effects between the two elements of the wattmeter are eliminated.
   (b) A voltage: 100 sinwt+40cos(3wt-30^o)+50sin(5wt+50^o)V is applied to the pressure circuit of a wattmeter and through the current coil is passes a current of 8 sin wt+6 cos (5wt-120^o)A. What will be the reading of the wattmeter? [10+6]

4. Explain the functions of the following in a single phase induction type Energymeter.
   (a) Shunt and series magnets
   (b) Moving disc
   (c) Permanentmagnet
   (d) Shading bands and holes in disc. [4+4+4+4]

5. Explain the following in A.C. potentiometer:
   (a) Drysdale phase shifting Transformer.
   (b) Transfer instrument. [8+8]

6. Explain the following:
   (a) Why is Kelvin's double bridge superior to the wheat-stone bridge for the purpose of low resistance measurement?
   (b) How the difficulties associated with the measurement of a very high resistance are over come?

(c) How the effects of contact resistance and resistance of the connecting leads are eliminated in the measurement of resistance by Kelvin's double bridge?

(d) Why is the Voltmeter-Ammeter method unsuitable for the precise measurement of the low resistance? [4+4+4+4]

7. (a) Draw the circuit diagram and phasor diagram of Owen's bridge under balance conditions. Derive the equations under balance conditions.

(b) An owen's bridge is used to measure the properties of a sample of sheet steel at 2KHz. At balance, arm ab is test specimen; arm bc is R_3 =100Ω; arm cd is C_4 = 0.1 μF. Calculate the effective impedance of the specimen under test conditions. [10+6]

8. (a) What is ballistic galvanometer? What are its special features?

(b) Explain the theory and working principle of ballistic galvanometer? [6+10]

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Code No: R05310202 **Set No. 3**

III B.Tech I Semester Regular Examinations, November 2008
ELECTRICAL MEASUREMENTS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the different effects used in producing deflecting torque in an analog instruments. State the examples, in which these effects are used?
   (b) Define the terms "indicating instruments", "recording instruments" and "integrating instruments". Give examples of each case.
   (c) Derive the equation for deflection if the instrument is PMMC spring controlled. [5+5+6]

2. Explain the constructional details and working of a single phase electrodynamometer type of powerfactor meter. Prove that the special displacement of moving system is equal to the phase angle of the system. [16]

3. (a) Draw the possible methods of connection the pressure coil of a wattmeter and compare the errors. Explain the meaning of "Compensation winding" in a Wattmeter and show how they help to reduce the error.
   (b) A dynamometer type wattmeter has a field system which may be considered long compared with its moving coils. The flux density is 0.012T, the mean diameter of the moving coil is 3 cm and the moving coil turns are 500. The current through the moving coil is 0.05A and power factor of the circuit of which power is measured is 0.866. Calculate the torque when the axis of the field and moving coils are [8+8]
      i. 30^o
      ii. 90^o.

4. Explain the constructional 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. [16]

5. (a) Draw the circuit of d.c. potentiometer. Explain how you can calibrate the same against a standard cell. Discuss the effect of room temperature on this calibration.
   (b) Explain how the potentiometer may be used for precise measurement of voltage (240V d.c.). [10+6]

6. (a) Explain how insulation resistance of a cable can be measured with a help of loss of charge method?

(b) The following results were obtained by loss of charge method of testing cable:
discharged immediately after charging the deflection = 200 divisions;
discharged 30 seconds after charging the deflection = 125 divisions;
discharged 30 seconds after charging, when in parallel with a resistance of 10 MΩ, the deflection = 100 divisions. Calculate the insulation resistance of the cable. [8+8]

7. (a) Explain the working of Hay's bridge for measurement of inductance with a circuit diagram. Derive the equations for balance and draw the phasor diagram under balanced conditions.

(b) The four arms of a Hay's bridge are arranged as follows: AB is a coil of unknown impedance; BC is a non-reactive resistor of 100 Ω; CD is a non-reactive resistor of 833 Ω in series with a standard capacitor of 0.38μF; DA is non-reactive resistor of 16800 Ω. If the supply frequency is 50 Hz, determine the inductance and the resistance at the balanced conditions. [10+6]

8. Explain the construction and working principle of flux meter with a neat diagram. [16]

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Code No: R05310202 **Set No. 4**

III B.Tech I Semester Regular Examinations, November 2008
ELECTRICAL MEASUREMENTS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the construction and working of an attracted disc type kelvin absolute electrometer.
   (b) What are the advantages and disadvantages of the above instrument?
   (c) Can it be used for measurement of low voltages such as 100 V? Give the reason. [6+6+4]

2. Derive the expressions for ratio and phase angle error of a potential transformer. State the assumptions made for derivation of these errors. [16]

3. (a) Draw the necessary circuit diagram for measurement of three phase power by two wattmeter method. Make necessary derivations. In case of balanced, discuss the effects of the following load power factors on the two wattmeter readings.
      i. zero
      ii. unity
   (b) The power to a 3-phase induction motor was measured by this method, and the readings were 3,400 and ?1,200 watts respectively. Calculate the total power and power factor. [10+6]

4. (a) Explain the different sources of errors in single phase induction type energymeter.
   (b) A 50 A, 230 V meter on full load test makes 61 revolutions in 37 seconds. If the normal disc speed is 520 revolutions per Kwh, find the percentage error. [10+6]

5. (a) Describe the steps when D.C. crompton's potentiometer is used to measure an unknown resistance?
   (b) A basic slide wire potentiometer has a working battery voltage of 3 volts with negligible internal resistance. The resistance of slide wire is 400 Ω and its length is 200 cm. A 200 cm scale is placed along the slide wire. The slide wire has 1 mm scale divisions and it is possible to read upto of a division. The instrument is standardized with 1.018 V standard cell with sliding contact at the 101.8 cm mark on scale. Calculate:
      i. Working current
      ii. The resistance of series rheostat
      iii. The measurement range and

iv. The resolution of the instrument. [10+6]

6. (a) Draw the circuit diagram of a Wheatstone bridge and derive the conditions for balance.

   (b) The four arms of a Wheat shone bridge are as follows: AB = 100 Ω; BC = 10 Ω; CD = 4 Ω; DA = 50 Ω. The galvanometer has a resistance of 20 Ω and is connected across BD. A source of 10V d.c. is connected across AC. Find the current through the galvanometer. What should be the resistance in the arm DA for no current through the galvanometer? [8+8]

7. (a) What is the difference between L.V. schering bridge and H.V. schering bridge?

   (b) Draw the circuit diagram of H.V. schering bridge.

   (c) A capacitor bushing forms arm ab of a schering bridge and a standard capacitor of 500 pF capacitance and negligible loss, forms arm ad. Arm bc consists of a noninductive resistance of 300 Ω. When the bridge is balanced arm cd has a resistance of 72.6 Ω in parallel with a capacitance of 0.148 μF. The supply frequency is 50 Hz. Calculate the capacitance and dielectric loss angle of capacitor. Derive the equations for balance and draw the phasor diagram under conditions of balance. [4+3+9]

8. (a) Explain the theory of flux meter with a neat sketch.

   (b) A flux density =0.05 W/m^2; turns on moving coil=40; area of moving coil=750 mm^2 If the flux linking with a 10 turn search coil of 20 mm^2 area connected to the flux meter is reversed in a uniform field of 0.5 W/m^2, calculate the deflection of the flux meter. [10+6]

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