Register Number.....

B.E DEGREE EXAMINATIONS: OCTOBER/NOVEMBER-2008

Third Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U07EI 301: Electrical Measurements And Instrumentation

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions: -

PART A (20x1=20 Marks)

1. A galvanometer is an instrument used to measure
   A. non electrical parameters
   B. all electrical parameters
   C. frequency
   D. small current and voltage in a circuit

2. A ballistic galvanometer should be designed with
   A. a large period of natural oscillation and a negligible damping constant.
   B. a small period of natural oscillation and a high damping constant.
   C. a large period of natural oscillation and a high damping factor.
   D. a small period of natural oscillation and a low damping factor.

3. A moving iron instrument can be used for current and voltage measurements
   A. in ac circuits only
   B. in dc circuits only
   C. in both ac and dc circuits for any value of frequency(in case of ac circuits)
   D. in both ac and dc circuits for frequencies up to about 125 Hz(in case of ac circuits).

4. A 1 mA ammeter has a resistance of 100Ω.It is to be converted to a 1 A ammeter. The value of shunt resistance is
   A. 0.001 Ω
   B. 100Ω
   C. 100000 Ω
   D. 0.1001 Ω

5. In an electrodynamometer type watt meter
   A. the current coil is made fixed
   B. the pressure coil is fixed
   C. any of the two coils i.e. current coil or pressure coil can be fixed
   D. both the coils should be movable.

6. Pressure coil of the wattmeter is connected
   A. in series with the load
   B. across the supply
   C. in parallel with the current coil
   D. in series with the current circuit

7. The braking torque by a permanent magnet in a single phase energy meter is proportional the
   A. square of the flux of the permanent magnet
   B. speed of the meter
   C. distance of the permanent magnet from the center of the revolving disc
   D. all of the above

8. Phantom loading for testing of energy meter is used
   A. to isolate the current and potential circuits
   B. to reduce power loss during testing
   C. for meters having low current rating
   D. to test meters having a large current rating for which loads may not be available in laboratory and also reduces power loss during testing

9. When a potentiometer is used for measurement of voltage of an unknown source, the pov consumed in the circuit of the unknown source under null conditions
   A. is very high
   B. is height
   C. is small
   D. is ideally zero

10. The burden of current transformers is expressed in terms of
   A. secondary winding current
   B. V A rating of transformer
   C. voltage, current and power factor of secondary winding circuit
   D. primary winding current

11. The secondary winding of a CT in a measurement circuit is always
   A. short circuited
   B. open circuited
   C. connected to the load circuit in the measurement system
   D. connected across the supply

12. The error in a PT is
   A. ratio error
   B. phase angle error
   C. both ratio error and phase angle error
   D. turns ratio error

13. In a resistance measurement system using ammeter and voltmeter, the reading of the voltmeter is 100V and ammeter is 20 A. The value of the resistance is
   A. 0.2 Ω
   B. 5 Ω
   C. 0.005 Ω
   D. 1 /20x100 Ω

14 The instrument used to measure insulation resistance is
   A. Kelvin's bridge
   B. Megger
   C. both Kelvin's bridge and Megger
   D. milli Ohmmeter

15. Equal resistances of 100Ω each are connected in each arm of a Wheatstone bridge which is supplied by a 2V battery source. The galvanometer of negligible resistance connected to the bridge can sense as low current as1 μA. The smallest value of resistance that can be measured is
    A. 20m Ω
    B. 2μ Ω
    C. 20 μ Ω
    D. 900 Ω

16. From the point of view of safety, the resistance of earthing electrode should be
    A. low
    B. high
    C. medium
    D. the value of resistance of earth electrodes does not affect the safety

17. Maxwell's inductance-capacitance bridge is used for measurement of inductance of
    A. low Q coils
    B. medium Q coils
    C. high Q coils
    D. low and medium Q coils

18. Frequency can be measured by using
    A. Maxwell's bridge
    B. Schering bridge
    C. Heaviside Campbell bridge
    D. Wien's bridge

19. The Q- factor of a coil in a RLC series circuit of a bridge is
    A. 1/ωCR
    B. ωCR
    C. L/RC
    D. R/ωL
    Where ω angular frequency in rad./sec

20. The bridge circuit used to measure mutual inductance is
    A. Maxwell's bridge
    B. Campbell's bridge
    C. Wein's bridge
    D. Andeson's bridge

PART B (5 x 16 = 80 Marks)

21 (a) (i) Explain the construction and working principle of D'Arsonval galvanometer. (10)

(ii) A moving coil instrument gives a full scale deflection of 10 mA when the potential difference across its terminals is 100 mV. Calculate (a) the shunt resistance for a full scale deflection corresponding to 100 A, (b) the series resistance for full scale reading with 1000 V. (6)

(OR)

(b) (i) Explain the construction and working principle of PMMC instrument and state its applications. (10)

(ii) A simple shunted ammeter using a basic meter movement with an internal resistance of 1800 Ω and a full scale deflection current of 100 μA is connected in circuit and gives reading of 3.5 mA on its 5mA scale. This reading is checked with a recently calibrated d.c ammeter which gives a reading of 4.1 mA. The implication is that the first ammeter has a faulty shunt on its 5 mA range. Calculate (a) the actual value of faulty shunt; (b) the correct shunt for the 5 mA range. (6)

22 (a) Explain the construction and working principle of Electrodynamometer type wattmeter. State the possible errors in this type of wattmeter. (16)

(OR)

(b) Explain the construction and operating principle of single phase induction type energy meter. Also state its applications. (16)

23 (a) (i) Draw the circuit diagram of a Crompton's potentiometer and explain its working. Describe the procedure for measuring an unknown resistance. (10)

(ii) State and explain any two applications of ac potentiometers. (6)

(OR)

(b)(i) Describe the construction and working of a co-ordinate type ac potentiometer .How an unknown voltage can be measured? (10)

(ii) Explain the construction of bar and wound primary current transformer. (6)

24 (a) Draw the circuit of a Wheatstone bridge and derive the conditions of balance. Also state the factors affecting the precision measurement of medium resistance with Wheatstone's bridge. (16)

(OR)

(b) Draw the circuit of a Kelvin's double bridge used for measurement of low resistance. Derive the condition for balance. (16)

25 (a)(i) Explain the construction and working principle of vibration galvanometer. (10)

(ii) In a Maxwell's inductance comparison bridge, the arm AB consists of a coil with inductance L_1 and resistance r_1 in series with a non-inductive resistance R, arm BC and AD has a non-inductive resistance of 100 Ω., and arm AD consists of standard variable inductor L_2 having resistance 32.7 Ω.Balance is obtained when L_2=47.8 mH and R=1.36 Ω.Find the resistance and inductance of the coil in arm AB. (6)

(OR)

(b) Explain the circuit diagram of Anderson's bridge and derive the expression to measure the unknown inductance. (16)

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