Where cos ϕ is power factor of the circuit and $\beta = \tan^{-1}(wL/R)$, where L and R are the inductance and resistance of the pressure coil of ciruit. **10**

7. (a) Explain Electrical Resonance type Frequency meter in detail. **10**

   (b) Describe Electrodynamic type power factor meter in detail. State its advantages and disadvantages.**10**

SECTION – D

8. (a) Explain loss of charge method used for measurement of high resistances. What are the difficulties encountered in measurement of high resistances. **10**

   (b) Draw the circuit of Kelvin's double bridge, used for measurement of low resistances. Derive condition for balance. **10**

9. (a) Derive equation of balance for an Anderson's bridge. Draw phasor diagram for conditions under balance. Discuss advantages and disadvantages of bridge. **10**

   (b) Describe how an unknown capacitance can be measured with the help of De Sauty's bridge. What are the limitations of this bridge and how they can be overcome by using a modified form of De Sauty's bridge. Explain with the help of phasor diagram. **10**

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B. Tech. 3rd Semester (EE)

Examination – December, 2018

ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

Paper : EE-209-F

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

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) What is the major cause of creeping error in an energy meter ? **2**

   (b) What is Standard ? What are different types of standards ? **2**

   (c) What are practical difficulties in ac potentiometer ? **2**

   (d) Why PMMC instruments are not used for ac measurements ? **2**

   (e) How range of instruments can be extended in PMMC instruments ? **2**

(f) Which instrument can be used to measure non-Sinusoidal voltage ? 2

(g) Why is Scale of MI instrument calibrated non-linearly ? 2

(h) Define limiting error. 2

(i) When Kelvin bridge is used and why ? 2

(j) State disadvantages of Dynamometer type wattmeter. 2

SECTION – A

2. (a) Describe various forces required for proper operation of an Indicating Instrument. 10

(b) Define the following terms : 10
   (i) Repeatability
   (ii) Accuracy
   (iii) Precision
   (iv) Sensitivity
   (v) Resolution

3. (a) What are the basic blocks of Generalized Instrumentation System ? Draw various blocks and explain function of each block. 10

(b) Three Resistors of having resistances of 250 Ω, 500 Ω and 375 Ω are connected in parallel. The 250Ω resistor has + 0.025 fractional error, 500 Ω resistor has – 0.036 fractional error and the 375 Ω resistor has + 0.014 fractional error. Determine : 10
   (i) The total resistance neglecting errors.
   (ii) Total resistance considering error of each resistor.
   (iii) Fractional error of the total resistance based upon rated values.

SECTION – B

4. (a) Classify Instruments based upon their type of Measurement. 10

(b) Compare following type of Instruments in accordance to their suitability for ac and dc, Robustness, Accuracy, Scale, error, uniformity, cost : 10
   (i) Hot wire
   (ii) Electrostatic
   (iii) PMMC
   (iv) Moving iron
   (v) Electrodynamometer

5. (a) Describe construction and working of PMMC instrument. Derive equation for deflection if Instrument is spring controlled. 10

(b) What are the shunts and multiplier ? Derive expression for both, with reference of meters used in electrical circuits. 10

SECTION – C

6. (a) Describe principle of operation of single phase energy meter. An energy meter is designed to make 100 revolutions of the disc for one unit of energy. Calculate the number of revolutions made by it, when connected to a load carrying 40A at 230V and 0.4 P. F. for 1 hour. If it actually makes 360 revolutions, find the percentage error. 10

(b) Prove that for electrodynamometer type wattmeter true power = $(\cos\phi/(\cos\phi\cos(\phi-\beta)))$ X Actual wattmeter Reading.