B.E. Electrical (Electronics & Power) Engineering Fourth Semester

EP404 - Electrical Measurements & Instrumentation

P. Pages : 3 **GUG/W/18/1552**

Time : Three Hours * 1 2 2 1 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Answer **Five** questions as per internal choices.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Use of Mobile is not permitted.

1. a) Which type of instruments are called unpolarised instrument? Justify. **4**

b) Explain with neat sketch principles of operation of Ammeter and voltmeter. **4**

c) A millivoltmeter has two ranges 0-20 mv and 0-100 mv. The meter has resistances of 400 Ω and 500 Ω respectively on the two ranges. In a certain dc circuit the meter gave the following readings. when connected between points A and B **8**

i) Reading on 20 mv range = 19.5 mv
ii) Reading on 100 mv range = 23.4 mv
a) What is the true value of the emf?
b) What should be the resistance of the voltmeter if the above measurement is to be done with 99% accuracy.

OR

2. a) Write a short note on shunt and multiplier for moving iron instrument. **4**

b) Explain how electrodynamometer type of instrument can be used as. **4**

i) Voltmeter.
ii) Ammeter.
iii) Wattmeter.

c) The inductance of a moving iron ammeter with a full scale deflection of 90º at 1.5 A is given by the expression. **8**

$L = \left(200 + 40\theta - 4\theta^2 - \theta^3\right)\mu H.$

Where θ is the deflection in radian from the zero position.
Estimate the angular deflection of the pointer for a current of 1.0 A.

3. a) Explain with neat sketch the Generalised instrumentation system with practical example. **8**

b) Explain the construction and working of any method to measure the angular speed. **4**

c) Write a short note on **any two.** **4**

1) Piezo Electric Transducer.
2) Semiconductor strain gauge.
3) Load cells.

OR

4. a) Explain the different static and dynamic characteristics of instrument. **8**

b) In a parallel circuit the current in one branch I_1 is 100 ± 2A and in the other I_2 is 200 ± 5A. Determine the total Current Considering errors as. **4**

a) Limiting error and
b) Probable error

c) Explain the following terms. **4**

1) Histogram.
2) Standard deviation.

5. a) Write a short note on wattmeter errors. **4**

b) What is Blondel's theorem? **4**

c) A single phase wattmeter measuring power in 230 V circuit has a current coil of resistance 0.2 ohm and pressure coil of resistance 1000 ohm. Load current is 10 A at a P.F. of 0.8 (lag). Determine the % error in wattmeter reading when. **8**

i) Pressure coil is Connected On load side.
ii) Pressure coil is Connected on supply side.

OR

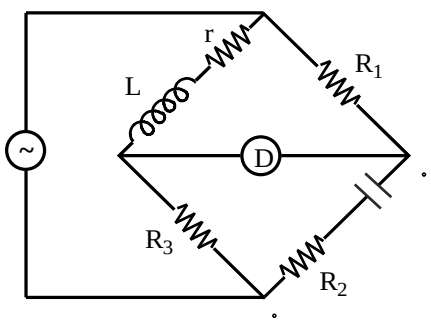
6. a) Explain construction and operation of maximum demand indicator. **4**

b) Write a short note on trivector meter. **4**

c) A single phase induction type energy meter is adjusted to read correctly at unity p.f. It is observed that at $\frac{1}{4}$ full load current of 0.5 lagging power factor the effective voltage magnet flux lags behind the current magnet flux by 27°. will it introduce any error in the instrument? If so calculate the % error introduced. **8**

7. a) Explain the suitable bridge for measurement of self inductance having quality factor $Q > 10$. Draw the phasor diagram. **8**

b) In the bridge as shown in figure Q.7 (b) below, the conditions at balance at a frequency of 500 cycles /sec, $R_1 = 750\ \Omega$, $C = 0.35\ \mu f$, $R_2 = 64.9\Omega$, $R_3 = 2410\ \Omega$ find L and r. Will the bridge remain balanced at a Frequency of 600 cycles / sec? **8**



OR

8. a) Explain the loss of charge method Give the range of the resistance for which it is used. **4**

b) Write a short note on earth tester. **4**

c) The ratio arms of a kelvin's bridge are 100 Ω each. The galvanometer has an internal resistance of 500 Ω each and the current sensitivity of 200 mm/μA. The, unknown resistance is 0.1002 Ω and the standard resistance is set at 0.100 Ω. A dc current of 10A is passed through the standard and the unknown resistance from 2.2 V battery in series with a rheostat. Calculate the deflection of the galvanometer. **8**

9. a) Define and explain. Planks Law of radiation. **4**

b) What is thermistor? Explain its construction, resistance – temperature characteristics and applications. **4**

c) A copper – constantan thermocouple was found to have linear Calibration between 0ºC to 400ºC with emf at maximum temperature equals to 20.68 mv (Reference Junction temperature is 0ºC) **8**

i) Determine the correction which must be made to the indicated emf if the cold junction temperature is 25ºC.

ii) If the indicated emf is 8.92 mv in the thermocouple circuit, determine the temperature of the hot junction.

OR

10. a) Write a short note on Weston's frequency meter. **8**

b) Power is to be measured in a high voltage system using CT PT and wattmeter. Give complete circuit diagram Assume 1ϕ system. **4**

c) What are the elastic elements are used for pressure measurement? Explain them briefly. **4**

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