

7. (a) Explain the working principle of Schering bridge and derive an expression for measurement of unknown capacitance. Draw the phasor diagram under null condition and explain how dissipation factor of the capacitor can be calculated.
- (b) The four arms of a HAY's bridge are arranged as follows: AB is a coil of unknown impedance; BC is $1000\ \Omega$; CD is $833\ \Omega$ in series with $0.38\ \mu\text{F}$; DA is $16800\ \Omega$. If the supply frequency is 50 Hz, determine L and R in balanced condition. Derive the condition for balance and draw the phasor diagram under balanced conditions.

7+7

8. (a) Discuss the advantages of electronic voltmeters as compared with conventional type voltmeter. Explain the construction and principle of operation of a thermocouple type R.M.S. responding voltmeter.
- (b) Explain the working principle of Ballistic galvanometer. Mention how it is calibrated.
- 7+7
9. (a) Discuss in detail the principle of operation of electronic voltmeter with the help of a circuit diagram.
- (b) Name the different types of digital voltmeters. Explain the working principle of "successive approximation type" of DVMs. Discuss its important features.

7+7

Code : 031507

B.Tech 5th Semester Examination, 2016

Electrical Instruments & Measurements

Time : 3 hours

Full Marks : 70

Instructions :

- (i) *There are Nine Questions in this paper.*
- (ii) *Attempt Five questions in all.*
- (iii) *Question No. 1 is compulsory.*
- (iv) *The marks are indicated in the right-hand margin.*

1. Answer any Seven of the following questions: $2 \times 7 = 14$

- (a) What will happen if a voltmeter is connected in place of an ammeter?
- (b) Write the expression to find the value of shunt resistance for range extension of an ammeter.
- (c) What are the sources of error in the wattmeter? How can they be minimized?
- (d) What is the difference between wattmeter and energy meter?
- (e) How does vibration galvanometer differ from D'Arsonval galvanometer?

- (f) What is difference between a slide wire potentiometer and direct potentiometer?
- (g) Describe the application of ac potentiometer.
- (h) Why magnetic measurements are not as accurate other types of measurement in electrical engineering?
- (i) Discuss the advantages of electronic voltmeters.
- (j) What is A/D converter?
- (k) CRO should always be calibrated before using.
2. (a) Show the constructional features of moving iron (attraction type) instruments. Explain its working principle. Also discuss its important features.
- (b) An PMMC instrument has a 0.12 T magnetic flux density in its air gaps. The coil dimensions are $D=1.5$ cm and $l=2.25$ cm. Determine the number of coil turns required to give a torque of $4.5 \mu\text{N-m}$ when the coil current is $100 \mu\text{A}$. 7+7
3. (a) Explain the principle of operation of an electrodynamics type instrument. What is the type of damping device used in this type of instrument.
- (b) A wattmeter has a current coil of 0.1Ω resistance and pressure coil of 6500Ω . Calculate the percentage error due to resistance only with each of the methods of connection, when reading the input to an apparatus which takes 12 A at 250 V with 0.4 p.f. 7+7

4. (a) Draw the circuit of a compensated wattmeter, and explain how it eliminates the measurement error.
The inductive reactance of pressure coil circuit of a dynamometer wattmeter is 0.4% of its resistance at normal frequency. Calculate the percentage error and correction factor due to inductive reactance for a load at 0.707 p.f. lagging.
- (b) What are the errors in energy meter and how they are compensated in 3-phase energy meters? 7+7
5. (a) Explain the configuration and working of Crompton potentiometer. How it can be used for calibration of ammeters and voltmeters?
- (b) With the help of circuit diagram describe the procedure to draw the complete B-H loop of a ring specimen. 7+7
6. (a) Discuss the use of instrument transformer. Explain why the secondary of C.T. should not be open-circuited when primary is connected. Also differentiate between current transformer and potential transformer.
- (b) A current transformer with turn-ratio of 1:201 is rated as 1000/5 A, 25 V A. The core loss and magnetising component of primary currents are 3 A and 7 A under rated condition. Find the ratio and phase angle errors for full burden at 0.8 p.f. leading. 7+7