

This question paper contains 4 printed pages.]

Your Roll No.

8481

A

B. Tech. (Part Time)/II
Paper (EEE-205)—ELECTRICAL MEASUREMENT
AND INSTRUMENTATION

Time : 3 Hours

Maximum Marks : 70

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt any five questions.

All questions carry equal marks.

Assume missing data, if any.

1. (a) Explain the terms accuracy, sensitivity and resolution as used for indicating instruments. Differentiate between probable errors and random errors, giving suitable examples. 9

- (b) The following 10 observations were recorded when measuring voltage :

41.7, 42, 41.8, 42.0, 42.1, 41.9, 42.0, 41.9, 42.5, 41.8. Find the

(i) Mean, (ii) Standard deviation, (iii) the probable error of one reading, (iv) the probable error of mean, and (v) range. 5

[P.T.O.]

2. (a) Describe how Schering bridge can be used for measurement of known capacitance and its loss angle. Draw the phasor diagram of the bridge circuit under conditions of balance. What modifications are made for using it at high voltage ? 7

- (b) Show that the Wien bridge will be balanced at only one frequency given by :

$$f = \frac{1}{2\pi \sqrt{C_1 C_2 R_1 R_2}} \text{ Hz}$$

Where C_1 , C_2 , R_1 , and R_2 have their usual meanings. Draw the phasor diagram for this particular frequency. 7

3. (a) Describe the construction and working of a Magnetic oscillograph. Derive the expression for critical damped oscillograph. 7

- (b) A 100 V, 5A range watt-meter is used in conjunction with instrument transformers to measure power consumed by a 6kV single phase load taking 100 A at 0.5 pf (lagging).

Compute the power indicated by watt meter. Also define the multiplying factor of a watt meter. 7

4. (a) Explain the advantages of electronic voltmeters over conventional type voltmeters. With circuit diagram, describe the working principle of any one type of digital voltmeter. 7

- (b) A $3\frac{1}{2}$ digit DVM has an accuracy specification of ± 0.5 percent of reading + 1 digit. (i) What is the possible error in volt, when the instrument is reading 5.00 V on the 10 V range ? (ii) What is the possible error in volt, when reading 0.10 V on the 10 V range ? 7
5. (a) Describe the working principle and construction of thermocouples. Describe the various types of compensations employed and methods used for measuring their output voltage. Give the merit, demerit and applications of thermocouples. 7
- (b) A strain gauge with gauge factor of z is fastened to a metallic member subjected to a stress of $1,000 \text{ kg/cm}^2$. The modulus of elasticity of this metal is $2 \times 10^6 \text{ kg/cm}^2$. Calculate the percentage change in resistance of strain gauge. What is the value of Poisson ratio ? 7
6. (a) Describe the construction and working of a co-ordinate type a.c. potentiometer. How is it standardized ? Explain, how unknown voltage can be measured with it ? Discuss the sources of error in these instruments. 7
- (b) A basic slide wire potentiometer has a working battery of 3.0 V with negligible internal resistance. The resistance of slide wire is 400Ω and its length is 200 cm. A 200 cm scale is placed along the slide wire. The slide wire has 1 mm scale division and it is [P.T.O.]

possible to read upto 1/5 of a division. The instrument is standardized with 1.018 V standard cell with sliding contact at 101.8 cm mark on scale. Calculate (a) working current, (b) resistance of series circuit, (c) the measurement range, and (d) resolution of instrument. 7

7. (a) Discuss the principle of working and circuit diagram of digital storage oscilloscope. 7

- (b) Draw an analog computer set up for solving the differential equation :

$$\ddot{y} + 5.4\dot{y} + 0.58y = e(t)$$

Also state the need of time scaling in solving the differential equations. 7

8. Write notes on any **two** of the following : 2 × 7

- (i) Kelvin double bridge
- (ii) Induction type energy meter
- (iii) Pneumatic transducers