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Question Paper Code : 52955

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Electrical and Electronics Engineering

EE 6404 — MEASUREMENTS AND INSTRUMENTATION

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a standard? What are the different types of standards?

2. Define accuracy and hysteresis.

3. Which torque is absent in energy meter? Why?

4. Why ordinary watt meters are not suitable in place of Low Power Factor circuits?

5. When a Kelvin bridge used and why?

6. Enumerate the principle of grounding.

7. What is drop out?

8. List any two storage devices.

9. What is known as thermocouple effect and how it is used in a transducer?

10. What is POT? Is it active or passive transducer?

PART B — (5 × 13 = 65 marks)

11. (a) (i) With a suitable illustration elaborate the significance of calibrations. (8)

(ii) Discuss the different types of standards of measurements. (5)

Or

(b) Classify and explain the different types of errors of measurements. Also mention its compensation methods. (13)

12. (a) Discuss the construction and its working principle of electrodynamometer type wattmeter. Also derive its expression. (13)

Or

(b) (i) How to measure the power using instrument transformers? Explain. (5)

(ii) How do you demonstrate the B-H curve using "step by step" method. (8)

13. (a) (i) A terminal resistor of approximately 50 $\mu\Omega$ resistance was measured by means of a kelvin bridge having the following component resistance. Standard resistor = 100.03 $\mu\Omega$, inner ratio arms = 100.31 Ω and 200 Ω, outer ratio arms = 100.24 Ω, resistance of link connecting the standard and the unknown resistance = 700 $\mu\Omega$. Calculate the unknown resistance to the nearest 0.01$\mu\Omega$. (3)

(ii) Consider a kelvin double bridge consists each of the ratio arms P=Q=p=q=1000Ω. The emf of the battery is 100V and a resistance of 5Ω included in the battery circuit. The galvanometer has a resistance of 500Ω and the resistance of the link connecting the unknown resistance to the standard resistance may be neglected. The bridge is balanced when the standard resistance $s = 0.001\Omega$.

(1) Determine the value of unknown resistance.

(2) Determine the current through the unknown resistance R balanced.

(3) Determine the deflection of the galvanometer when the unknown resistance R is changed by 0.1 percent from its value at balance the galvanometer has a sensitivity of 200 mm/μA. (10)

Or

(b) (i) In the measurement of power by a polar potentiometer, the following reading were obtained. Voltage across a 0.2 ohm standard resistance in series with the load = 1.46/32°V. Voltage across a 200 : 1 potential divider across the line = 1.37/56°v. Estimate the current, voltage, power and power factor of the load. (7)

(ii) A co–ordinate type potentiometer is used for determination of impedance of coil and result obtained are, voltage across a 1.0 ohm resistor in series with the coil +0.238 V on in–phase dial and 0.085 V on quadrature dial. Voltage across a 10 : 1 potential divider used with the coil : +0.3375 V on in–phase dial and 0.232 v on quadrature. Calculate the resistance and reactance of the coil. (6)

14. (a) With neat diagram, explain the parts of CRT in detail. (13)

Or

(b) Discuss in detail about the various types of magnetic tape recorders. (13)

15. (a) Discuss about the selection criteria for the transducer? Explain the working principles and characteristics of LVDT with neat sketch. Give advantages, disadvantages and applications of LVDT. (13)

Or

(b) Design the Block diagram arrangement of DAS and describe the function of each component and also state its applications. (13)

PART C — (1 × 15 = 15 marks)

16. (a) The following data refers to a moving coil galvanometer whose resistance is 460 ohm and a resistance of 1970 ohm is connected in series with it.

No.of.turns	=	250
Flux density density	=	0.1 wb/m^2
Control constant	=	$0.15*10^{-6}$
Dimension of coil	=	30*30 mm
Moment of inertial of coil	=	$0.2*10^{-6}$ kg m^2

Calculate :

(i) the resistance to be connected to galvanometer for critical damping,

(ii) relative damping,

(iii) logarithmic decrement,

(iv) frequency of free damped oscillation

(v) period of undamped and damped

(vi) first maximum deflection. (15)

Or

(b) In a test temperature is measured 100 times with variation in apparatus and procedure. After applying the correction the results are

Temp (degree)	397	398	399	400	401	402	403	404	405
Frequency	1	3	12	23	37	16	4	2	2

Calculate :

(i) arithmetic mean,

(ii) mean deviation

(iii) standard deviation

(iv) the probable error of one reading

(v) the standard deviation and the probable error of the mean

(vi) the standard deviation of the standard deviation. (15)