Q2 (a) Define the following with respect to the measuring system:

(i) True value **(ii) Static correction**

(iii) Relative error **(iv) Reproducibility**

Answer

(i) **True value:** Average of infinite readings measured.

(ii) **Static correction:** Difference between true value and measured value.

(iii) **Relative error:** Ratio of error occurred to the specified magnitude.

(iv) **Reproducibility:** The ability of the instrument to show the same reading for the same input.

Q2 (b) A voltmeter has a range of 0-5 V. The true value of the measured voltage is 3V, while the read value is 2.95 V. What is the absolute error and relative error?

Answer

Absolute error = 2.95-3.0 = -0.05

Relative error = (0.05/3) x 100 = 1.66 %

Q2 (c) What is dynamic response? Explain the various types of dynamic response. How are they different from dynamic characteristics?

Answer

Dynamic response is the response of a measuring instrument to varying input conditions. The two types of response are Transient and frequency.

Q3 (a) Derive an expression for the sensitivity of a Wheatstone bridge.

Answer Page Number 521 of Textbook I

Q3 (b) What are the advantages and disadvantages of an Anderson's bridge? In an Anderson's bridge the different arms have components as shown in Fig.1. Calculate the value of unknown inductance. Where R_3 = 600Ω, r = 400Ω, R_4 = 600Ω, R_2 = 600Ω, C = 0.5μF

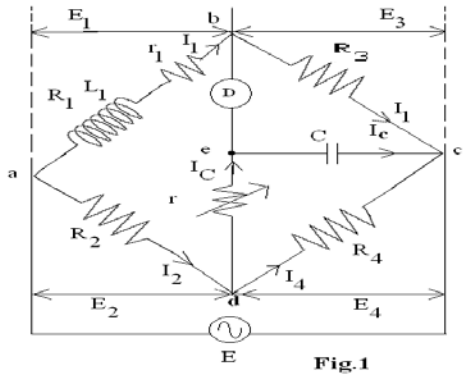

Fig.1

Answer

Advantages:

1. It is much easier to obtain balance in the case OG Anderson`s bridge.
2. Fixed Capacitor can be used.

Disadvantages:

1. More complex than its prototype Maxwell's bridge.

$L = C (R3/R4) [r (R4+R2) + R2R4]$

$= 0.5 \times 10^{-6} (600/600) [400 (1200) + 240000]$

$= 0.36$

Q4 (a) Draw the scheme of a Multi-range ammeter. Design a multi-range DC ammeter with an internal resistance 10Ω. The full scale deflection current is 10 mA and it is required to measure 0 to 50 mA, 0 to 100 mA and 0 to 250 mA

Answer Page Number 63 of Textbook II

Q4 (b) Explain the working of a True RMS voltmeter.

Answer Page Number 98 of Textbook II

Q5 (a) Draw a schematic of a Dual Slope DVM and explain its principle.

Answer Page Number 117 of Textbook II

Q5 (b) What is the importance of Q in a RLC circuit? Explain the principle of Q measurement. Calculate the shunt resistance required in a LC circuit given inductance of 10 mH and capacitance 200 pF. The internal resistance of inductance is 12 Ω. The required Q of the circuit is 10 at a frequency of 100 kHz.

Answer Page Number 274 of Textbook II

Q6 (a) Explain the procedure to calculate the sensitivity of an optical receiver.

Answer Page Number 227 of Textbook II

Q6 (b) Define sensitivity and deflection factor of a Cathode Ray Tube (CRT). What are the role of the following in CROs:

(i) Time base generator circuit (ii) X-channel
(iii) Triggered Sweep (iv) Astigmatism

Answer Page Number 185 of Textbook II

Q7 (a) What is the difference between wave analyzer and spectrum analyzer? Explain and discuss the principle of a spectrum analyzer.

Answer Page Number 256 of Textbook II

Q7 (b) What is the purpose of heterodyning in a high frequency measurement?

Answer
With the present day technology it is difficult to measure the various quantities of a high frequency signal directly. Hence it is customary to down convert the input frequency to a frequency which can be comfortably measured. This process of down conversion is called heterodyning.

Q8 (a) Bring out the difference between CRO and recorders. Draw the schematic of a simple X-Y recorder.

Answer Page Number 784, 1309, 1315 of Textbook I

Q8 (b) What is the principle of working of magnetic recorders? Explain the recording process.

Answer Page Number 355 of Textbook II

Q9 (b) Discuss the various metals used for temperature sensing and converting to electrical signal.

Answer Page Number 427-437 of Textbook II

Text Book

1. A Course in Electrical and Electronic Measurements and Instrumentation, A.K Sawhney, Dhanpat Rai & Co., New Delhi, 18th Edition 2007.

2. Electronic Instrumentation, H.S Kalsi, Tata McGraw Hill, Second Edition 2004.