

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 =  $(0.05/3) \times 100 = 1.66 \%$

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  $R_3 = 600\Omega$ ,  $r = 400\Omega$ ,  $R_4 = 600\Omega$ ,  $R_2 = 600\Omega$ ,  $C = 0.5\mu F$

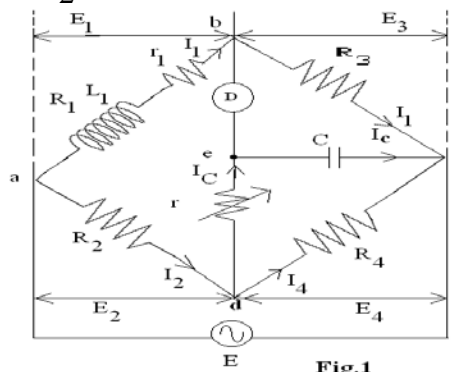


Fig.1

**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.

$$\begin{aligned}L &= C (R_3/R_4) [r (R_4+R_2) + R_2R_4] \\ &= 0.5 \times 10^{-6} (600/600) [400 (1200) + 240000] \\ &= 0.36\end{aligned}$$

**Q4 (a) Draw the scheme of a Multi-range ammeter. Design a multi-range DC ammeter with an internal resistance  $10 \Omega$ . 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  $12 \Omega$ . 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.**