



- Notes :
1. All questions carry as indicated.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Diagrams and Chemical equation should be given wherever necessary.

1. a) Discuss suspension galvanometer. Derive expression for torque and deflection of galvanometer. 8
- b) State different types of errors? Discuss limiting error and statistical analysis of error. 8

**OR**

2. a) Explain the mechanism of Permanent Magnet Moving Coil instrument. 8
- b) Discuss static and dynamic characteristics of measurement system. 8
3. a) Explain Multimeter in detail. 8
- b) Explain series and shunt type ohmmeter in detail. 8

**OR**

4. a) Introduce the Electrodynamicometer type of measuring instruments. 8
- b) Classify resistance and state different types of measuring systems for measurement of resistance. Explain substitution method for measurement of resistance. 8
5. a) A modified form of wheat stone bridge is shown in the figure, calculate the value of unknown resistance  $R_T$  if  $R_a = 1200\Omega$ ,  $R_a = 1200R_b$ ,  $R_1 = 800R_b$ ,  $R_1 = 1.25R_2$  and  $R_3 = 0.5R_b$  are the resistance values under balance conditions. 5

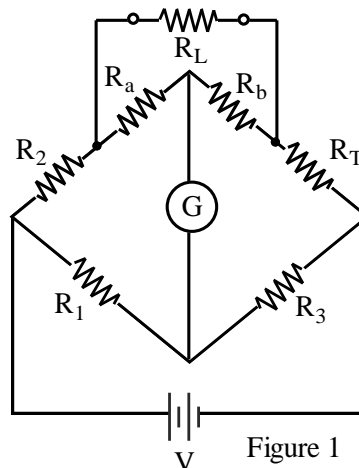


Figure 1

- b) Define: 1) Current sensitivity ( $S_i$ ) 3  
 2) Voltage sensitivity ( $S_v$ )  
 3) Bridge sensitivity ( $S_B$ )

- c) A Kelvin double bridge shown in figure 2 below in which each of the ratio arms  $P = Q = p = q = 1000 \Omega$ . The emf of the battery is 100 V and a resistance of  $5 \Omega$  is included in the battery circuit. The galvanometer has a resistance of  $500 \Omega$  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  $S = 0.001 \Omega$ .  
 a) Determine the value of unknown resistance.  
 b) Determine the current through the unknown resistance  $R$  at balance.  
 c) 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  $200 \text{ mm}/\mu\text{A}$ .

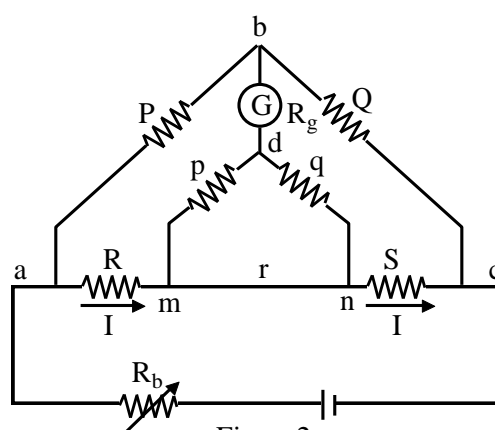


Figure 2

**OR**

6. a) Explain Hay's Bridge in detail and state advantages and disadvantages for the same. 6  
 b) State Bridge Balance condition and methods to find unknown elements in AC Bridges. 10
7. a) State different types of digital voltmeter. Explain integrating type of DVM in detail. 8  
 b) Introduce the True RMS-Responding Voltmeter. Draw the required diagram and derive the Output voltage formula for the same. 8

**OR**

8. a) Draw clean diagram and explain the Electronic AC voltmeter using rectifiers. 8  
 b) Explain LCR -Q meter in detail. 8
9. a) Discuss basics of Cathode Ray Oscilloscope, its advantages and Graticule in detail. 8  
 b) Derive deflection sensitivity and deflection factor of CRO. 8

**OR**

10. a) Explain Lissajous Pattern appearing on the screen of CRT when a sinusoidal input voltage is applied. 10  
 b) Draw and explain block diagram of Cathode Ray Tube (CRT) in detail. 6

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