Total No. of Questions : 12] **[Total No. of Pages : 4**

P1535 **[3762]-151**

S.E. (Instrumentation)

FUNDAMENTALS OF INSTRUMENTATION

(2008)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates :

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following terms: **[8]**

i) Precision and significant figures.

ii) Fidelity.

iii) Measuring lag.

iv) Hystersis.

b) It is desired to measure the value of current in 500Ω resistor as shown in Fig.1 by connecting a 100Ω ammeter. Find **[8]**

i) Actual value of current.

ii) Measured value of current.

iii) The percentage error in measurement and accuracy.

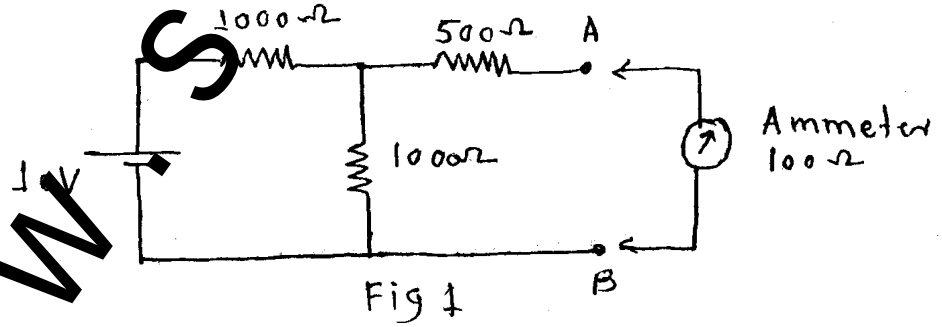


Fig 1

OR

Q2) a) Prove that, when shunt connected instrument is connected to circuit, the measured voltage is given by **[8]**

$$E_L = \frac{E_0}{1 + \frac{Z_0}{Z_L}}$$

where - E_L = Actual voltage measured.

Z_0 = Output impedance of circuit.

Z_L = Input impedance of circuit.

E_0 = Voltage at no load.

b) Explain general documented procedure for calibration of equipment. **[8]**

Q3) a) Sketch and describe the slide wire Potentiometer. Explain the process standardization. **[8]**

b) Design a series type of ohm - meter the movement to be used requires. 5mA for full scale deflection and has internal resistance of 50Ω. The internal battery has a voltage of 3V. The desired value of half scale resistance 3000Ω. Calculate the values of series and parallel resistances R_1 and R_2. **[8]**

c) Explain the function of swap miny resistance. **[2]**

OR

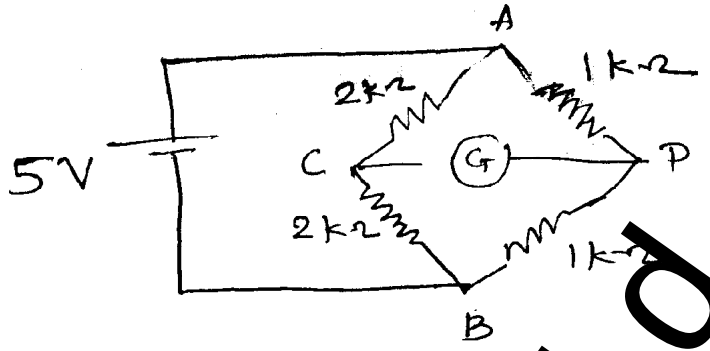
Q4) a) Explain the principle of working of moving Iron instruments. Explain the construction and working of attraction type and repulsion type of instruments. **[8]**

b) Design an Aryton shunt to provide an ammeter with current ranges of 1A, 5A and 10A. D'Arsonval movement with internal resistance of 1KΩ and full scale deflection current of 10mA is used. **[8]**

c) A basic D'Arsonval movement has a full scale deflection current of 100μA. It is used as voltmeter. Calculate sensitivity of voltmeter. **[2]**

Q5) a) Derive an expression to find unknown frequency using Wein bridge. **[8]**

b) As shown in circuit below of wheatstore bridge, the battery voltage is 5V with negligible internal resistance. The galvanometer has current sensitivity of 10mm/μA and internal resistance of 100Ω. Calculate the deflection of galvanometer caused by 15Ω unbalance in Arm BC. **[8]**



OR

Q6) a) Derive the balancing condition in Kelvin double bridge. **[8]**

b) Derive the equation for measuring dissipation factor & unknown capacitance using Schering bridge. **[8]**

SECTION - II

Q7) a) With the help of neat diagram, explain the construction and working of Digital Tachometer. **[8]**

b) Write a short note on digital kilo-watt Hour meter. **[8]**

OR

Q8) a) Explain how the distance is measured using Digital ultrasound meter. **[8]**

b) Write a short note on Digital thermometer. **[8]**

Q9) a) Explain amplitude, frequency, phase difference and unknown frequency is measured in dual trace oscilloscope. **[8]**

b) Explain the difference between dual mode & X-Y mode of dual trace oscilloscope. Also explain the Alt & Chop mode of dual trace oscilloscope. **[8]**

c) Explain how intersity knob controls the brightness of image in CRO. **[2]**

OR

Q10)a) Write the functions of various front Panel control of CRO. **[8]**

b) With the help of neat diagram explain the working of Digital Storage Oscilloscope. **[8]**

c) Write typical specifications of CRO. **[8]**

Q11)a) Explain with help of neat diagram concept of virtual instrumentation. **[8]**

b) Write a short note on potentiometric recorder. **[8]**

OR

Q12)a) Explain with help of neat diagram working of function generators. **[8]**

b) Explain the working of galvanometric type of recorders. **[8]**