B.E. INFORMATION TECHNOLOGY FIRST YEAR SECOND SEMESTER - 2018
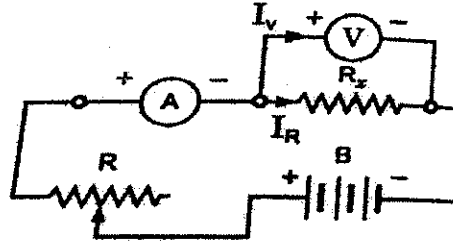
**Subject : ELECTRICAL MEASUREMENTS**   Time : 3hr   Full Marks : 100

Instruction: Answer any Five questions

1. I) Find the relative error while measuring an unknown resistance R_x as shown in figure. Consider the measured value of the resistance is R_m.


   II) A voltmeter having a sensitivity of 15kΩ/V reads 80V on a 100V scale, when connected across an unknown resistor. The current through the resistor is 2 mA. Calculate the % relative error.   **10+10**

2. I) Draw the circuit of Kelvin double ratio arm bridge and show how the effect of lead resistance is eliminated?
   II)The resistance of a shunt is measured using a Kelvin's double bridge. The following values give the resistance comprising the bridge at balance. Calculate the resistance of the shunt. Standard resistance = 1μΩ. Inner and outer ratio arms have same values equal to 2402Ω and 2000Ω. Link resistance between shunt and standard resistance of 0.1Ω. 2000Ω resistors are on the standard side of the bridge.   **10+10**

3. I) During calibration of a wattmeter it was found in the first instance that 30.4A current is flowing through a resistor market at 0.0105Ω. In the second instance it was found that the ammeter reading was taken 1.2% lower and the value marked on the resistor is 0.3% lower. Find the true value of power as a percentage of the calculation in the first instance.
   II) Explain the operation of an integrating instrument with example.
   III) Why an ammeter is always connected in series while a voltmeter is in parallel with the load?
   IV) Explain damping phenomenon of an instrument.   **8+3+4+5**

4. I) What are the advantages of electronic instrument over mechanical instrument?
   II) Classify instruments according to their use.
   III) Define "Drift", "Threshold", "Dead Zone", "Hysteresis" and "Precision".
   IV) Explain different types of error   **3+2+10+5**

5. I) Explain spring control and gravity control strategy of a measuring instrument.
   II) Explain deflection torque and show how it depends on current flowing through the instrument.
   III) Using dimensional analysis define the validity of the following expression: $R = \dfrac{1+\omega^2 C^2 R^2}{\omega^2 CR}$.   **10+6+4**

6. I) Consider the following figure to state if it is possible to balance the bridge. State reason. Also identify the condition to balance the bridge if found unbalanced.
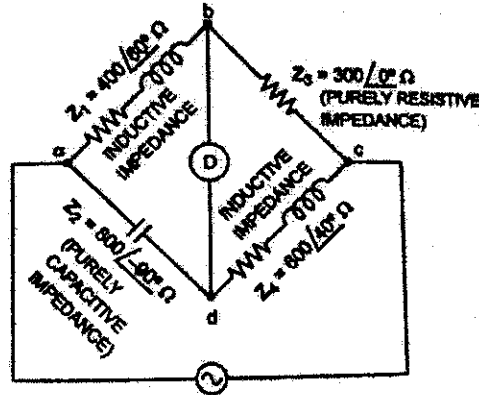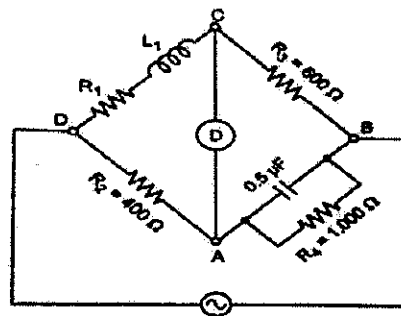
II) Find the value of unknown resistance and capacitance for the balanced bridge while a 50Hz supply is applied across a-c terminal.
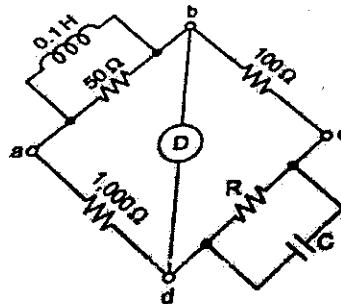
8+12

7. I) Explain the operation of Maxwell's inductance Bridge.

II) Find the unknown inductance and resistance for the following Maxwell's capacitance bridge. Also find the Q-factor of coil if frequency is 1000Hz.

10+10

8. A capacitor is tested by Schering bridge. It forms one arm AB of the bridge. The other arms are: AD- a non reactive resistance of 100Ω; DC-a non-reactive resistance of 300Ω shunted by a capacitor of 0.5μF; BC- a standard loss free capacitor of 100 μF, the supply frequency is 50Hz. Find the balancing condition of the bridge and also the capacitance and power factor of the capacitor under test.

20