أولى (٣)

Menoufia University	**Time: From 10 Am to 1 PM**
Faculty of Electronic Engineering	**13/6/2019.**
Dept. Industrial electronics and Control Eng.	**Electrical Measurements (ACE 125)**
Final-Term Exam (1st Year)	**No. of pages (2) - Full mark (30)**

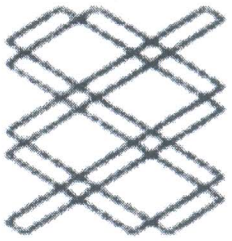
Part (II)

Answer the following questions:

Question (1): [15 Degree]

i) Explain the working principle of a linear variable differential transformer (LVDT). Show how it can be used for measuring small mechanical displacements.

ii) Find the frequency ratios for the Lissajous patterns produced by voltage applied to vertical and horizontal plates as shown in Figures (a) and (b), respectively.

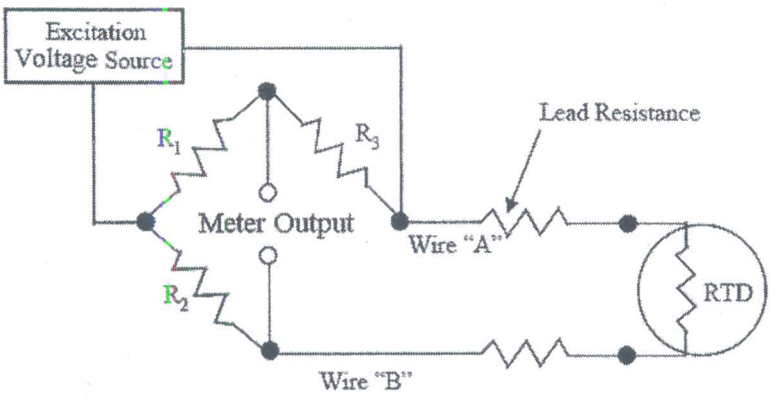


(a)

And find the frequency of the vertical plates if the frequency applied to horizontal plate is 70 Hz for the patterns shown in Figures (a) and (b).

(b)

iii) A resistance temperature detector (RTD) arranged in a bridge with each arm R_1=150Ω, R_2=60Ω and R_3=15Ω and Excitation Voltage Source is 24V. If the temperature of the sensor changed such that the meter indicates 0.75 volt, the material has temperature coefficient of 0.063 $^{\circ}C^{-1}$. The resistance at 0 °C is 6 Ω. Find the sensor temperature and the power consumed in it.



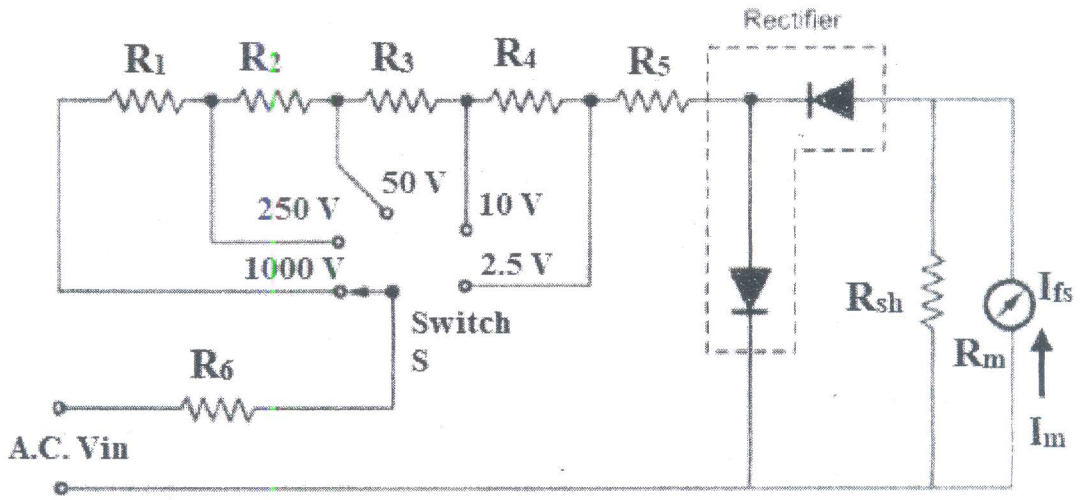
Question (2): [15 Degree]

i) Describe the working of Maxwell's inductance–capacitance bridge. Derive the equations for balance condition. Explain why it is suitable for measurement of inductors having quality factor in the range 1 to 10.

ii) With a neat sketch, briefly describe the principle of electromagnetic flow meter. What are the advantages of an electromagnetic flow meter?

iii) Two voltages E_1 and E_2 have the same frequency are applied to both the horizontal input and the vertical input of the CRT, respectively. The resulted trace on the screen is a symmetrical ellipse about horizontal and vertical axis. The slope of the major axis is negative. The maximum vertical value is 3 divisions and the point where the ellipse crosses the vertical axis is 2.6 divisions. Determine the possible phase angle of E_2 with respect to E_1.

iv) A meter movement has an internal resistance of 80Ω and requires 0.5mA dc for full scale deflection. Shunting resistance R_{sh} placed across the movement has a value of 100Ω and the value of R_6 equal 500Ω. Diodes D_1 and D_2 of figure have an average forward resistance of 70Ω each and are assumed to have infinite resistance in reverse direction. Calculate the values of the multiplier resistors.



Best Wishes

Dr. Ebrahim A. El-hamid