

FINAL EXAM

Subject: Measurement Techniques and Sensors

Duration: 90 Minutes

(Students are not allowed to use the materials. The examiners did not give any further explanation)

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Question 1: Express the following quantities in formular of the 7 SI units

Force	Power	Voltage	Inductance intensity	Magnetic Flux
Work	Pressure	Electricity	Capacity	Magnetic induction intensity
Conductivity	Frequency	Illuminance	Resistance	Voltage

Question 2: Given the table of values of 14 times the resistance value measurement by Kelvin double bridge. Determine the confidence interval within which the true value of the measurand R lies, given the confidence probability $P = 0.98$.

n	Value (mΩ)	n	Value (mΩ)	n	Value (mΩ)	n	Value (mΩ)
1	140.25	5	139.5	9	141.15	13	140.15
2	140.5	6	140.25	10	142.25	14	142.75
3	141.75	7	140	11	140.75		
4	139.25	8	126.75	12	144.15		

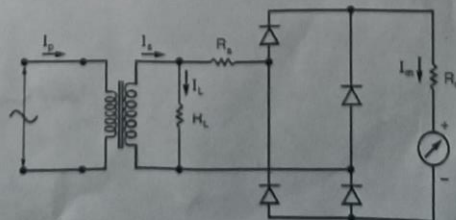
The probability distribution of error is normal and $k(13) = 2.685$.

Question 3:

$$\bar{x} = \frac{\sum x_i}{n} = \frac{140.25 + 140.5 + \dots + 142.75}{14}$$

a. Describe the basic requirements for current measuring instruments.

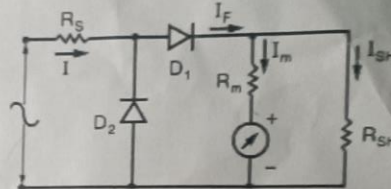
b. An ammeter uses a magnetometer with a full-wave rectifier circuit and a current transformer. The structure has $I_{fs} = 1mA$, $R_m = 1700\Omega$. The current transformer has $N_{sec} = 500$, $N_{pri} = 4$. Diodes have $V_F(\text{đinh}) = 0.7V$, $R_s = 20k\Omega$.



Ammeter-amplifier maximum deviation when primary current is $I_P = 250\text{mA}$. Calculate R_L .

Question 4:

- Describe the basic requirements for voltage measuring instruments.
- A voltmeter is composed of an electromagnetic measuring device with: $I_{fs} = 50\mu\text{A}$, $R_m = 1700\Omega$ combined with a half-wave rectifier circuit. Diode D_1 has a minimum forward current $I_F(\text{đinh}) = 100\mu\text{A}$. When the measured voltage is $20\% V_{\text{full-range}}$, the diode has $V_F = 0.7\text{V}$.



The voltmeter has a measuring range of 50V . Calculate R_S and R_{SH} .

Question 5: Presenting the structure and operating principle of the type of sensor performed in the practical test.