Tutorial Sheet No-4

Measurement Science & Techniques (UES034)

Q.1.The output of an LVDT is connected to a 5 V voltmeter through an amplifier whose amplification factor is 250. An output of 2 mV appears across the terminals of LVDT when the core moves through a distance of 0.5mm. Calculate the sensitivity of LVDT and that of the whole setup. The millivoltmeter scale has 100 divisions. The scale can be read to 1/5 of a division. Calculate the resolution of the instrument in mm.

Q2. A barium titanate pickup has the dimensions of 5mm X 5mm X 1.25mm. The force acting on it is 5 N. The charge sensitivity of barium titanate is 150pC/N and its permittivity is 12.5 X 10-9 F/m. If the modulus of elasticity of barium titanate is 12 X 106 N/m2 , Calculate the strain. Also calculate the charge and the capacitance.

Q3. Calculate the gauge factor of a strain gauge of a 1.5 mm diameter conductor that is 24mm long changes length by 1mm and diameter by 0.02mm under a compression force?

Q4. A resistance strain gauge having a gauge factor of 2 is fastened to a steel member which is subjected to a strain of 10-6. If the resistance of the unstrained gauge is 120Ω, calculate the change in the resistance of a gauge?

Q.5 A strain gauge has a resistance of unstrained gauge of 120Ω and the gauge factor of -12. What is the resistance value of the gauge when it is subjected to a strain of 1%?

Q6. A strain gauge having resistance of 120 Ω and a gauge factor of 2 is connected in series with a ballast resistance of 120 Ω across a 12 V supply. Calculate the difference between the output voltages (voltage across strain gauge) with no stress applies and with stress of 140 MN/m2. The modulus of elasticity of the member undergoing strain is 200GN/ m2

Q7. A capacitive transducer uses two quartz diaphragms area750 mm2 separated by distance of 3.5mm. A pressure of 900 kN/m2 when applied to the top diaphragm produces a deflection of 0.6mm. The capacitance is 370 pF when no pressure is applied to the diaphragms. Find the value of capacitance after the application of a pressure of 900 kN/m2.

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