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National Institute of Technology, Delhi

Name of the Examination: B.Tech

Branch	**: ECE**	**Semester**	**: VII**
Title of the Course	**: Electronics Instrumentation**	**Course Code**	**: EC401**

Time: 2Hours **Maximum Marks: 30**

Note:

- **Questions are printed on BOTH sides. Answers should be CLEAR, TO THE POINT AND LEGIBLE.**
- **All parts of a single question must be answered together and in the same sequence as given in question paper. ELSE QUESTION SHALL NOT BE EVALUATED.**

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1. A voltmeter having a sensitivity of 1KΩ/V reads 100V on its 150V scale when connected across an unknown resistor in series with a milliammeter. When milliammeter reads 5mA, Calculate (a) the apparent resistance of the unknown resistor (b) the actual resistance of the unknown resistor (c) the error due to the loading effect of the voltmeter. [3]

2. A symmetrical square wave is applied to average responding AC voltmeter. This symmetrical wave is shown in figure 1. The scale of meter is calibrated in terms of rms value of sine wave. Then calculate the form factor and the error occurring in meter indication. [3]

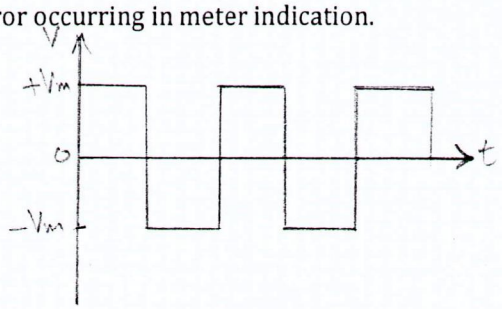


figure-1.

3. State the operating principle of Electrodynamometer (EDM). How can an Electrodynamometer be converted into a voltmeter. [2]

4. A moving coil instrument has the following data, Number of turns=100, width of the coil=20mm, depth of the coil=30mm and flux density in the gap=0.1Wb/m^2. Calculate the deflecting torque, when carrying a current of 10mA. Also Calculate the deflection, if the control spring constant is 2×10^{-6}Nm/degree. [3]

5. Calculate the value of the shunt resistors for the the circuit shown in figure 2. [3]

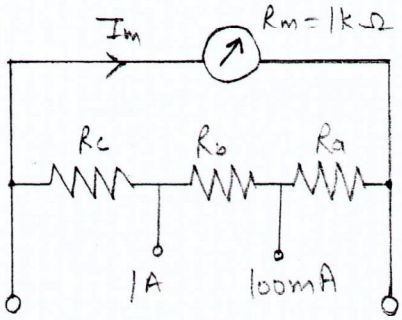


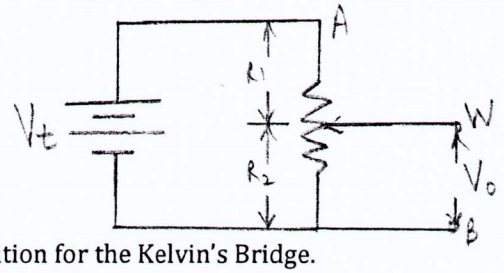
figure-2.

6. A thermistor has a resistance of 3980Ω at the ice point (0C) and 794Ω at 50°C. The resistance temperature relationship is given by equation R_T = a Ro exp [b/T]. Calculate the constants a and b. Also calculate the range of resistance to be measured in case the temperature varies from 40°C to 100°C. [3]

7. (a) Derive the expression for the Strain Gauge factor. [3]

   (b) A resistance strain gauge with gauge factor of 2 is cemented to a steel member, which is subjected to a strain of 1×10^{-6}. If the original resistance value of the gauge is 100Ω, Calculate the change in resistance. [2]

8. A displacement transducer with a shaft stroke of 3.0 inches is applied to the circuit of figure 3. The total resistance of the Potentiometer is 5KΩ. The applied voltage Vt is 5V. When the wiper is 0.9 inches from B, what is the value of the output voltage? [3]



figure·3.

9. Derive the balance condition for the Kelvin's Bridge. [3]

10. A maxwell Bridge is used to measure an inductive impedance. The bridge constants at balance are C1=0.01μF, R1=470KΩ, R2=5.1KΩ and R3=100KΩ. Find the series Equivalent of the unknown impedance. [2]