Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech. Mid Term

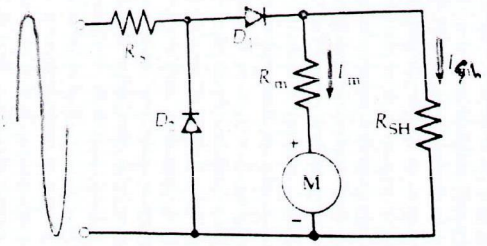
Branch	**: ECE**	**Semester**	**:2nd**
Title of the Course	**: Electronics Measurement and Instrumentation**	**Course Code**	**:ECB-254**

Time: 2 Hours **Maximum Marks:25**

1. Current was measured during a test as 30.4A, flowing in a resistor of 0.105Ω. It was discovered later that the ammeter reading was low by 1.2 percent and marked resistance was high by 0.3 percent. Find the true power as a percentage of the power that was originally calculated. [2]

2. A component manufacturer construct certain resistors to be anywhere between 1.14KΩ and 1.26KΩ and classifies them as 1.2KΩ resistors. What tolerance should be stated? If the resistance values are specified at 25°C and the resistors have a temperature coefficient of 500ppm/°C. Calculate the maximum resistance of one of these components at 75°C. (1ppm=1/1000000) [3]

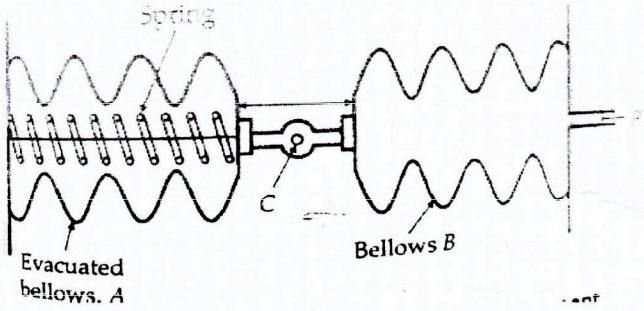
3. A PMMC instrument with FSD= 50μA and Rm=1700Ω is used in a half wave rectifier voltmeter circuit shown in figure 1. The silicon Diode (D1) must have a minimum (peak) forward current of 100μA when the measured voltage is 20% of FSD. The voltmeter is to indicate 50V rms at full scale. Calculate the values of Rs and Rsh. [4]



4. A moving coil voltmeter with a resistance of 20Ω gives a full scale deflection of 120° when a potential difference of 100mV is applied across it. The moving coil has dimensions of 30mm×25mm and is wound with two turns. The control spring constant is 0.375×10^{-6}Nm/deg. Find the flux density in the air gap. Find also the diameter of copper wire of coil winding if 30 percent of instrument resistance is due to coil winding. The specific resistance for copper=1.7×10^{-8} Ωm. [4]

5. A 0-100mA moving iron ammeter is converted to a 0-500V, 50Hz voltmeter by adding a series resistance with the coil. The coil has negligible resistance and an inductance $L=(0.01+0.2\theta)/4\pi$ henry, where θ is the deflection in radian. The total angular span of the meter is 100°. Compute (i) The Spring constant of the meter (ii) The series resistance required [3]

6. A differential bellows arrangement for measuring absolute pressure is shown in figure. It uses two bellows each of natural length 50mm, effective area=1500mm^2 and stiffness=0.5N/mm. Bellow A is evacuated and contains a spring of stiffness3N/mm. Find the required natural length of the spring if the bellows are to be equally compressed to a length of 40mm when a pressure of 100KN/m^2 absolute is applied to Bellow B. Also Find the displacement of the output point C for a change of 10KN/m^2 in applied pressure. [4]



7. A strain gauge with a 40cm wire length and a 25μm wire diameter has a resistance of 250Ω and a gauge factor of 2.5. Calculate the change in wire length and diameter when the resistance change is measured as 0.5Ω. Assume that the complete length of wire is strained positively. [3]

8. A parallel plate capacitive transducer has a plate area=40mm×40mm and plate spacing =0.5mm. Calculate the device capacitance and displacement that causes the capacitance to change by 5pF. Also determine the transducer sensitivity. [2]