UPES
End Semester Examination, December 2023

Course: Industrial Measurement and Instrumentation   **Semester: V**
Program: B. Tech – Electrical Engg   **Time   : 03 hrs.**
Course Code: EPEG3021   **Max. Marks: 100**

Instructions: All questions is to be answered

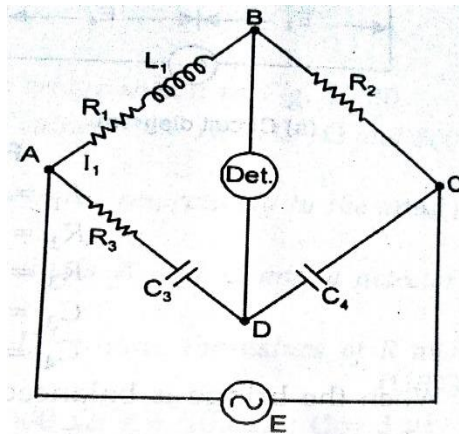|	**SECTION A** **(5Qx4M=20Marks)**		
S. No.		**Marks**	**CO**
Q 1	Enumerate the statement "Un – Calibrated Measuring instrument do not have any sanctity"	4	CO1
Q 2	Describe the working principle of a Ph meter	4	CO1
Q 3	Illustrate the Various Temperature transducers and their applicability	4	CO2
Q 4	A potentiometer is provided with 50 turns per mm. The gearing arrangement is such that the motion of the main shaft by one resolution crosses 4 resolutions. Determine the potentiometer's resolution.	4	CO2
Q 5	Describe the working principle of an Induction type Energy meter	4	CO3
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Evaluate and compare the power measurement by three-watt meter method vs Two wattmeter method.	10	CO3

Q 7	The Inductance of a moving iron ammeter with a full scale deflection of 90^0 at 1.5A is given by the expression: $L = (180 + 40\theta - 4\theta^2 - \theta^3)\mu H$. Where, θ is the deflection in radians from the zero position, calculate:
	   i) Spring Constant.
	   ii) The angular deflection of the pointer for a current of 1.0A
		10	CO2

Q 8	The bridge shown in Figure: 1 is used to measure the properties of a sample of a sheet at 2 kHz. At balance, arm AB is the test specimen; arm BC is R_2 =100Ω; arm CD is C_4 = 0.1 µF and arm DA is R_3 =834Ω in series with C_3 = 0.124 µF.
	   1. Name the bridge and list the parameters that can be used by this bridge.
	   2. Derive the expression for the measurement of unknown variables.
	   3. Calculate the effective impedance of specimen under test conditions.
	   4. Calculate the Q factor of the specimen under test.
		10	CO3

Figure:1

Q 9	A strain gauge with a gauge factor of 2 is subjected to stress of 1000 kg/cm2. E = 2×106 kg/cm2. Calculate the percentage change in resistance of the strain gauge. Find Poisson's ratio. **OR** A copper resistor having a resistance of 15 Ω at 20°C is used to indicate the temperature of a machine. Determine the limiting value of resistance k if the maximum temp is 175°C. Th e temperature coefficient. (T.C.) = 0.00425 at 20°C.	10	CO4

SECTION-C
(2Qx20M=40 Marks)

Q 10	A capacitive transducer uses two quartz diaphragms of area 750 mm2 separated by a 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 diaphragms. Find the value of capacitance after the application of a pressure of 900 kN/m2	20	CO5
Q 11	(A) A current transformer with a bar primary has 250 turns in its secondary winding. The resistance and reactance of the secondary circuit are 1.4 Ω and 1.1 Ω respectively including the transformer winding. When 5A current flows in the secondary winding, the magnetizing mmf is 80AT and the iron loss is 1.1 W. Determine the following: 　　　1. Ratio Error. 　　　2. Phase Angle Error. (B) Evaluate and compare a Current Transformer and Potential transformer.	10+10	CO4