Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

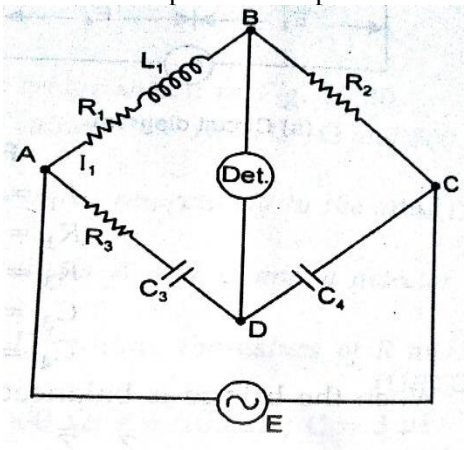
Course: Measurement and Instrumentation **Semester: III**

Program: B.Tech Electrical **Time : 03 hrs.**

Course Code: ECEG-2060 **Max. Marks: 100**

SECTION A
(4Qx5M=20Marks)

S. No.		Marks	CO
Q 1	State Blondel's theorem and its significance.	**05**	**CO1**
Q 2	A single-phase kWh meter makes 500 revolutions per kWh. It is found on testing to be making 40 revolutions in 58.1 seconds at 5 kW full loads. Find the percentage error.	**05**	**CO3**
Q 3	Justify the need and advantages of Calibration of any measuring device.	**05**	**CO2**
Q 4	A piezoelectric crystal having dimensions of 5mm x 5mm x 1.5mm and voltage sensitivity of 0.055 V-m/N is used for force measurement. Calculate the force if the voltage developed is 100V.	**05**	**CO3**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 5	Illustrate the working of linear variable differential transducer with neat block diagram. Also, brief the advantages and disadvantages.	**10**	**CO2**
Q 6	A 230 V, Single phase domestic energy meter has a constant load of 4 A passing through it for 6 hours at unity power factor. If the meter disc makes 2,208 revolutions during this period, what is the meter constant in revolutions/kWh? Calculate the power factor of the load if the no. of revolutions made by the meter are 1,472 when operating at 230 V, and 5A for 4 hours.	**10**	**CO3**
Q 7	A spring controlled electrodynamic voltmeter has an initial inductance of 0.78 H and 150 V range, the full scale deflection torque of $0.9* 10^{-4}$ Nm and full scale deflection current of 50 mA. Determine the difference between D.C. and 50 Hz A.C. readings at (i) 150 V (ii) 60 V. If the voltmeter inductance increases uniformly over the full scale of 90 degree. OR Draw the Equivalent circuit of Potential transformer and the complete phasor diagram at lagging power factor.	**10**	**CO4**
Q 8	Briefly explain the reason why A.C electrical tachometers preferred over D.C. tachometers with the help of block diagram.	**10**	**CO2**

SECTION-C (2Qx20M=40 Marks)			
Q 9	Draw the complete phasor diagram of the current transformer. Also derive the expression for its ratio, and phase angle errors.	**20**	**CO3**
Q 10	a. 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. i. Name the bridge and list the parameters that can be used by this bridge. ii. Derive the expression for the measurement of unknown variables. iii. Calculate the effective impedance of specimen under test conditions.  Figure 1 b. Derive the balance equation of a Maxwell Bridge. OR 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.	**20**	**CO4**