Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: Electrical Measurement and Instrumentation **Semester: IV**
Program: B.Tech- Electrical **Time :03 hrs.**
Course Code: EPEG 2004 **Max. Marks: 100**

Instructions: All questions are compulsory in section A and B
Attempt any two in section C

SECTION A

S. No.		Marks	CO
Q 1	Explain the working of Ramp type and integrating type of DVM with neat block diagram	**5**	**CO3**
Q 2	A single phase energy meter of induction type is rated 230 V, 10 A, 50 Hz has a meter constant of 600 rev./kWh when correctly adjusted. If quadrature adjustment is slightly disturbed so that the lag is 85 degree, calculate the percentage error at full load, 0.8 power factor lag.	**5**	**CO4**
Q 3	Show that change of capacitance affect due to change in distance between the plates in capacitive transducer.	**5**	**CO1**
Q 4	Derive the torque equation for Permanent Magnet Moving coil	**5**	**CO2**

SECTION B

Q 5	A strain gauge is bonded to a beam which is 12 cm long and has a cross sectional area of 3.8 cm^2. The unstrained resistance and gauge factor of the strain gauge are 220 ohm and 2.2 respectively. On the application of load the resistance of the gauge changes by 0.015 ohm. If the modulus of elasticity for steel is 207 GN/m^2, Calculate: (i) The change in length of the steel beam. (ii) The amount of force applied to the beam.	**10**	**CO4**
Q 6	Explain the working principle of venturimeter with neat diagram. Also, write down the advantages and disadvantages.	**10**	**CO1**
Q 7	The guaranteed accuracy of a flow meter working on thermal principles is 3% of full scale reading of $2.5* 10^{-6}$ m^3/s. If the flow measured by this meter is $1.25* 10^{-6}$ m^3/s, calculate the limiting error in percent.	**10**	**CO4**
Q 8	Derive the expression for the calculation of resistance using Kelvin's double bridge method.	**10**	**CO3**

SECTION-C

Q 9	(i) Draw a neat diagram of Anderson's bridge method. Deduce the equation when the bridge is under balance condition. Explain clearly how self-	**15+5**	**CO3**

		inductance is measured.		
	(ii)	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 ohm and 1.1 ohm respectively including the transformer winding. When 5A currents flows in the secondary winding, the magnetizing mmf is 80 AT and the iron loss is 1.1 W. Determine the Ratio Error.		
Q 10	(i)	A capacitor is tested by a schering bridge. It forms one arm AB of the bridge. The other arms are: AD= a non-reactive resistance of 100 ohm ; DC= a non-reactive resistance of 300 ohm shunted by a capacitor of 0.5 micro farad ; BC= a standard loss-free capacitor of 100 Pico Farad, the supply frequency is 50 Hz. The bridge is at balance with the above components. Deduce the balance condition of the bridge and hence find out the capacitance and power factor of the capacitor under test.	**10+10**	**CO4**
	(ii)	Write down the Generalised Data Acquisition System function with neat block diagram.		
Q11.	(i)	Define the term gauge factor and also derive the equation for strain gauge.	**15+5**	**CO2**
	(ii)	In a certain dynamometer ammeter the mutual inductance M varies with deflection as: M= - 8 cos (θ+30° ¿ mH Find the deflecting torque produced by a direct current of 60 mA corresponding to a deflection of 60°		

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SECTION A

S. No.		Marks	CO
Q 1	Explain the working of repulsion type moving iron meter.	**5**	**CO2**
Q 2	List down the various velocity measurement methods and describe any one.	**5**	**CO4**
Q 3	Show that the quality factor of Hay's bridge is not suited for measurement of high inductance.	**5**	**CO3**
Q 4	A moving coil meter has a resistance of 5 ohm and gives a full-scale deflection current with 5mA. Show that it can be used to measure current up to 10 A and find its shunt resistance.	**5**	**CO2**

SECTION B

Q 5	Write down the various type of errors occur in moving iron instruments and also show that $C=0.41\ (L/Rs^2)$, Where C=capacitor and L is the inductor.	**10**	**CO4**
Q 6	Briefly describe the working of single phase induction type energy meter	**10**	**CO3**
Q 7	Explain the working principle of Hall Effect transducer with neat diagram	**10**	**CO3**
Q 8	Derive the expression for the measurement of frequency.	**10**	**CO1**

SECTION-C

Q 9	(i) Explain the three phase power measurement by 2 wattmeter method with star connected load and also draw the phasor diagram (ii) A 3 phase 3 wire 415 V system supplies a balanced load of 20 A at a power factor 0.8 lag. The current coil of wattmeter 1 is in phase R and of wattmeter 2 in Phase B. Calculate: (i) The reading on 1 when its voltage coil is across R & Y. (ii) The reading on 1 when its voltage coil is across B & Y. (iii) The reading on 1 when its voltage coil is across Y & B.	**10+10**	**CO3**
Q 10	(i) Describe the loss of charge method.	**10+10**	**CO4**

	(ii) The following results were obtained by this method during testing a cable: Discharged immediately after charging, the deflection = 200 divisions Discharged 30 seconds after charging, the deflection = 1225 divisions Discharged 30 seconds after charging When in parallel with a resistance of 10 Mega ohm, the deflection = 100 divisions. Calculate insulation resistance of the cable.		
Q11.	(i) Explain the working principle of rotameter with neat diagram. Also, write down the advantages and disadvantages.	**10**	**CO3**
	(ii) A current transformer with a bar primary has 250 turns in its secondary winding. The resistance and reactance of the secondary circuit are 2.4 ohm and 1.5 ohm respectively including the transformer winding. When 5A currents flows in the secondary winding, the magnetising mmf is 80 AT and the iron loss is 1.5 W. Determine the Ratio Error and Phase Angle Error.	**10**	**CO2**