Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: Measurements and Instrumentation (ELEG 316) **Semester: V**
Program: BT-ASE-Spz-AV
Time: 03 hrs. **Max. Marks: 100**
Instructions: All questions are compulsory.

SECTION A (4*5=20 marks)

S. No.		Marks	CO
Q 1	A 0-100V voltmeter has an accuracy of +/- 1% of full scale reading. What will be the % error if the voltmeter reads 50V?	**5**	**CO2**
Q 2	A spring control instrument uses phosphor bronze spring to produce the controlling torque, if the ratio of length of the spring to the thickness of spring is 3000 for the deflection of 90^0, what should be this ratio if the scale is extended to 120^0?	**5**	**CO2**
Q 3	Which of the meters is more resistive and why a.) Voltmeter A having a range of 0-10V and a multiplier resistance of 18KΩ. b.) Voltmeter B having a range of 0-300V and a multiplier resistance of 298KΩ. Both the meters are having an internal resistance of 2 KΩ each.	**5**	**CO1**
Q 4	Compare Digital Instruments with Analog instruments on behalf of different parameters such as input impedance, speed of response, resolution, accuracy and operational power consumption.	**5**	**CO1**
	SECTION B (4*10=40 marks)		
Q 5	A galvanometer has a resistance of 5Ω and gives a full-scale deflection for a current of 15 mA. What maximum current can be measured if a 0.002 Ω resistor shunts it.	**10**	**CO3**
Q 6	A 31/2 digit multimeter has an accuracy specification of +/-0.05 % of the reading +5 counts. If the meter reads 2mA on the full scale of 20mA.The worst case error in the reading is……?	**10**	**CO3**
Q 7	The output of a LVDT is connected to a 5V voltmeter through an amplifier having an amplification factor of 250. An output of 2mV appears across the terminals of LVDT when a core moves to a distance of 0.5mm.Calculate the sensitivity of LVDT and that of the whole set up. If a millivolt meter scale has 100, divisions and the scale can be read to half of a division. Calculate the resolution of instrument in mm.	**10**	**CO3**
Q 8	Construct a neat-labelled Block diagram of Cathode Ray Tube, which is based on the	**10**	**CO2**

	operation of an electrostatic methodology?		
	SECTION-C(2*20=40)		
Q 9	A Cu constantan thermocouple was found to have linear calibration between 0-400ºC with emf. at maximum temperature (ref. junction at 0ºC) equal to 20.68 mV. Determine: a.) Correction which must be made to indicate emf. if the cold junction temperature is 25ºC. b.) If the indicated emf. is 8.92mV in the thermocouple circuit. Determine the temperature of hot junction.	**20**	**CO4**
Q10	a.) Considering a cylindrical wire, find the generalized expression of guage factor for metal wire stain gauges.	**10**	**CO3**
	b.) A quartz, piezoelectric transducer $0.5cm^2$ in area and 1mm thick is connected to a charge amplifier having a feedback capacitance of 30pF. The charge sensitivity of transducer is 2pC/N. In the frequency range of operation of transducer, the amplifier can be assumed to have an infinite input impedance and a negligible output impedance. A sinusoidal force of $30*10^{-3}$Sin 150t N is applied on a transducer. What is a peak to peak voltage swing and the amplifiers output?	**10**	**CO4**
	**********ALL THE BEST**********		

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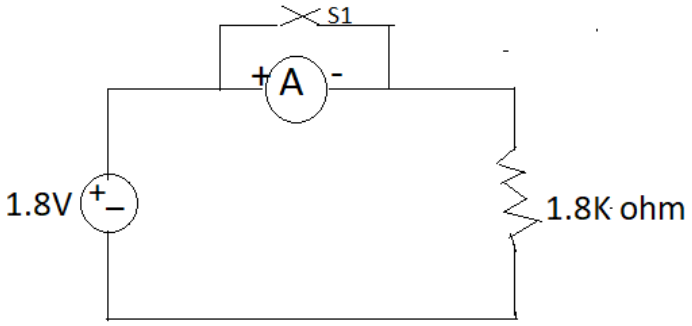
SECTION A (4*5=20 marks)

S. No.		Marks	CO
Q 1	Compare Digital Instruments with Analog instruments on behalf of different parameters such as input impedance, speed of response, resolution, accuracy and operational power consumption.	**5**	**CO1**
Q 2	A voltmeter having a guaranteed accuracy of 1.5 % reads 9V on a 0-150 V voltmeter scale. Calculate the % limiting error?	**5**	**CO1**
Q 3	A strain guage with nominal resistance of 120Ω and a guage factor of 2 undergoes a strain of 10^{-5}.What is the change in resistance in response to the strain?	**5**	**CO1**
Q 4	A spring control instrument uses phosphor bronze spring to produce the controlling torque, if the ratio of length of the spring to the thickness of spring is 3000 for the deflection of 90^0, what should be this ratio if the scale is extended to 120^0?	**5**	**CO2**
SECTION B (4*10=40 marks)			
Q 5	Derive the expression for measurement of Pressure using Active Transducers. Illustrate Piezoelectric effect.	**10**	**CO2**
Q 6	The PMMC ammeter A shown in figure has arrange of 0-3mA. When switch S1 is opened, the pointer swings to the 1mA mark returns & settles at 0.9mA mark. The meter is: a.) Critically damped and has a coil resistance of 100 Ω. b.) Critically damped and has a coil resistance of 200 Ω. c.) Underdamped and has a coil resistance of 100 Ω. d.) Underdamped and has a coil resistance of 200 Ω.	**10**	**CO3**

			
Q 7	A galvanometer has a resistance of 5Ω and gives a full-scale deflection for a current of 15 mA. What maximum current can be measured if a 0.002 Ω resistor shunts it.	**10**	**CO2**
Q 8	A voltmeter reads 14 V on its 100 V range and the ammeter reads 75mA on its 150 mA range in the circuit. Both the instruments are guaranteed to an accuracy of +/- 2% of full scale deflection. Calculate the limiting error in the measured power?	**10**	**CO2**
SECTION-C(2*20=40)			
Q 9	a.) Construct a neat-labelled Block diagram of Cathode Ray Tube, which is based on the operation of an electrostatic methodology? b.) A Cathode Ray Tube has an anode voltage of 2KV and parallel deflecting plates are 2cm long and 5mm apart. The screen is 30cm away from center of the plates. The input voltage is applied to deflecting plates through amplifiers having an overall gain of 50.The input voltage require to deflect the beam will be……?	**10+10**	**CO3**
Q10	a.) Considering a cylindrical wire, analyze the generalized expression of guage factor for metal wire stain gauges.	**10**	**CO4**
	b.) A linear resistance potentiometer is 100mm long and is uniformly wound with a wire of total resistance of 10,000 Ω. Under normal conditions, the slider is at the center of potentiometer. Determine the linear displacement when the resistance of potentiometer as measured by wheat stone bridge is 3700 Ω.If it is possible to measure a minimum value of 5Ω resistance with this set-up. Determine the resolution of the potentiometer.	**10**	**CO4**
	**********ALL THE BEST**********		