

Name:	
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

Programme Name: B.Tech/ PSE

Semester : V

Course Name : Electrical Measurement & Instrumentation

Time : 03 hrs.

Course Code : EPEG 2004

Max. Marks : 100

Nos. of page(s) : 2

Instructions: Attempt all the questions.

SECTION A

S. No.	Question	Marks	CO
Q 1	Define a transducer. What is the difference between sensor and transducer? Name some of the active and passive transducers, which are used in the measurement of physical quantities.	(5)	CO2, CO3
Q 2	Draw the block diagram of CRT. Write the function of each block and mention the applications.	(5)	CO1
Q 3	<ol style="list-style-type: none"> 1. Present the comparative study of LEDs and LCDs. Mention their applications. 2. Describe the necessity of grounding. List the various methods available to grounding techniques. 	(2.5+2.5)	CO1 CO2
Q 4	Define the galvanometer constants. Present the dynamic response using these intrinsic constants.	(5)	CO2, CO4

SECTION B

Q 5	<ol style="list-style-type: none"> 1. Compare and contrast a thermocouple with a thermistor and RTD as a temperature detector. 2. State and explain the laws of thermocouple. 	(6+4)	CO2, CO5
Q 6	<ol style="list-style-type: none"> 1. Describe the construction and working of ultrasonic flowmeters. 2. What are the limitations and advantages of measurement of liquids flow by magnetic flowmeters? 3. Briefly describe with a diagram as to how the flow rate of liquids can be measured by magnetic flowmeters. 	(5+2+3)	CO1, CO2

Q 7	<p>1. Describe the attraction type and repulsion type moving iron instruments in brief.</p> <p>2. The Inductance of a moving iron ammeter is given by the expression:</p> $L = (12 + 5\theta - 2\theta^2)\mu H$ <p>Where, θ is the deflection in radians from the zero position, calculate:</p> <p>I. Spring Constant.</p> <p>II. The angular deflection of the pointer for a current of 10A if the deflection for a current of 5A is 30°.</p>	(5+5)	CO1, CO3
Q 8	<p>Present the comparison of current and potential transformers. Describe how instrument transformer errors can be minimized.</p> <p style="text-align: center;">OR</p> <p>A 100/5A current transformer, at its rated load of 20VA, has an iron loss of 0.18W and a magnetizing current of 1.4A. It is supplying rated output to a meter having a ratio of resistance to reactance of 4. Calculate:</p> <p>A. Ratio Error</p> <p>B. Phase Angle</p>	(10)	CO3

SECTION-C

Q 9	<p>1. Present the measurement scheme of an unknown inductance by Hay's Bridge. Draw the circuit diagram and derive the expression for unknown parameters.</p> <p>2. In a four arm bridge network (shown in fig:1), the arm AB consists of an imperfect condenser, BC and CD are non- reactive resistances of 1000Ω each and DA is a standard capacitor of $0.0115\mu F$ capacitance in series with a resistance of 140Ω. If the bridge is balanced for frequency $\omega = 7500$ radians/sec, find the shunt-less resistance and capacitance of the imperfect condenser.</p>	(10+10)	CO4
-----	---	---------	-----

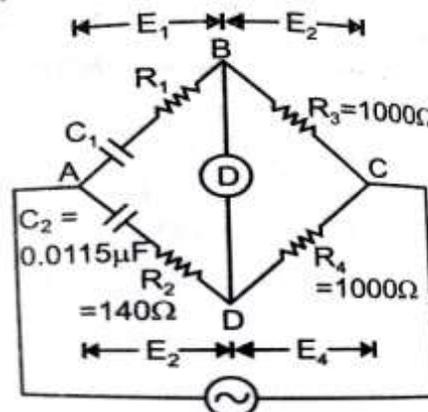


Fig:1

Q 10	<p>1. Discuss the construction and working principle of a linear variable differential transformer (LVDT). Explain how the magnitude and direction of the displacement of core of an LVDT detected? Also mention its industrial applications.</p> <p>2. A simple electrical strain gauge of resistance 120Ω and having a gauge factor of 2 is bonded to steel having an elastic limit stress of 400 MN/m^2 and modulus of elasticity is 200 GN/m^2. Calculate the change in resistance,</p> <p>A. Due to change in stress equal to 1/10 of the elastic range.</p> <p>B. Due to temperature of 20°C if the material is advance alloy. The resistance temperature coefficient of advance alloy is $20 \times 10^{-6}/^\circ\text{C}$.</p> <p style="text-align: center;">OR</p> <p>1. Analyze the terms charge sensitivity and voltage sensitivity by describing the working principle of piezo-electric transducers and derive the expression for generated Emf.</p> <p>2. A capacitive transducer uses two quartz diaphragms of area 750 mm^2 separated by a distance of 3.5mm. A pressure of 950 KN/m^2 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 950 KN/m^2.</p>	(10+10)	CO1, CO2, CO5
------	---	---------	------------------------------