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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2017

Branch: Civil Engineering

Stream: Structural Engineering

01 CE 6111 Elective I - Experimental Methods and Instrumentation

Answer *any two full* questions from *each* part

Limit answers to the required points.

Max. Marks: 60 Duration: 3 hours

PART A

1. a. Discuss the various errors in measurement and their causes. How can they be rectified? 4

   b. Determine the resistance of a certain length of wire, which is given by 5

$$R = {4\rho l}/{\pi d^2}$$

   Where

   Length, $l = 523.8 \pm 0.2cm$

   Resistivity, $\rho = 45.6\times10^{-6} \pm 0.15\times10^{-6}\,\Omega cm$

   Diameter, $d = 0.062 \pm 1.2\times10^{-3}\,cm$

2. a. Explain the different types of calibration. 4

   b. A second order instrument has a time constant of 0.2 seconds. For a step input and a sinusoidal input find the time at which output signal is three fourth of the input signal. 5

3. a. Explain the frequency response character of a first order instrument 3

   b. A first order instrument is used to measure a frequency of 100 Hz with a amplitude inaccuracy of 10%. What is the maximum allowable time constant? What will be the phase shift at 70 Hz? 6

PART B

4. a. Derive the relation for strain sensitivity of an electrical resistance strain gauge. 5

   b. How is temperature compensation achieved in a quarter bridge. 4

5. a. Briefly describe the steps in strain gauge installation. 4

	b.	Explain the principle and working of a LVDT.	5
6.	a.	Find the amplitude of recorded motion for a seismic instrument of mass 100g, stiffness 1 N/mm and damping ratio 0.4 if the motion to be measured is 5 sin200t (mm). Also find the maximum frequency for which the instrument can be used as an accelerometer if the error is not to exceed 10%.	6
	b.	Explain the sensitivity of a potentiometer circuit.	3

PART C

7.	a.	Discuss the calibration of photo elastic materials	6
	b.	Discuss the principle and working of a rebound hammer.	6
8.	a.	Discuss the effect of stressed model in a circular polariscope.	12
9.	a.	Explain a computerized data acquisition system.	6
	b.	Explain the ultrasonic pulse velocity test including its applications.	6