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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2015

Civil Engineering

(Structural Engineering)

01CE6111 Experimental Methods and Instrumentation

Duration: 3 Hrs. Max. Marks: 60

Answer any **TWO** questions from each part.

PART A (2×9=18 marks)

1. a) Explain the generalised measuring system. (4 marks)

   b) Write notes on

   i) Systematic Errors ii) Drift (5 marks)

2. a) Derive the harmonic response characteristics of a first order system and comment on its performance. (6 marks)

   b) Two pressure gauges (pressure gauge A and B) have a full scale accuracy of ± 5%. Sensor A has a range of 0-1 bar and Sensor B, 0-10 bar. Which gauge is more suitable to be used if the reading is 0.9 bar? (3 marks)

3. a) A seismic motion transducer has a seismic mass of 50 g, spring of stiffness 2 N/cm and damper with a damping constant 3.8 N s/m. The relative motion of the seismic mass with respect to the frame of the transducer is converted to a voltage, by a first order system of time constant 0.01s and static sensitivity 2V/mm. Find the output voltage for an input motion of 0.51mm at a frequency 30 Hz. (6 marks)

   b) Comment on the step response of a first order instrument (3 marks)

PART B (2×9=18 marks)

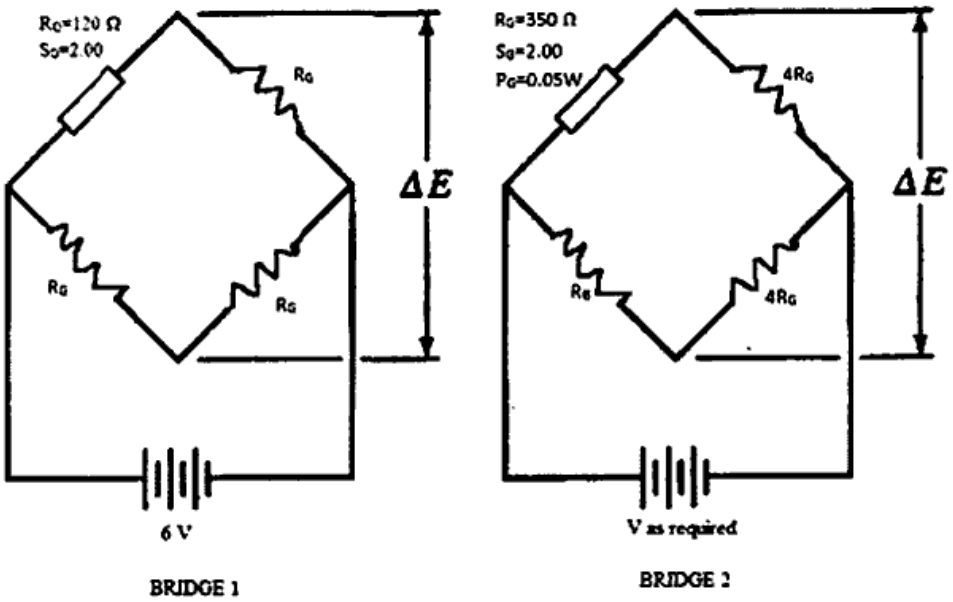
4. a) Explain transverse sensitivity in electrical foil resistance strain gauges. (6 marks)

   b) Explain any one method of calibration of accelerometers. (3 marks)

5. a) Explain the principle and working of diaphragm pressure transducers. (5 marks)

   b) Explain the working and advantages of semiconductor strain gauges. (4 marks)

6. Compare the circuit sensitivities of the bridges shown in Fig. below. Also compute the required voltage for Bridge 2. (9 marks)



PART C (2×12=24 marks)

7. a) Explain the process of calibration of photoelastic materials. (6 marks)
   b) Explain in detail, the ultrasonic pulse velocity method for testing of concrete. (6 marks)

8. a) Discuss the working of cathode ray oscilloscope. (5 marks)
   b) Discuss the method of separation of fringes by the shear difference method. (7 marks)

9. Explain the optical effects observed in a circular polariscope. (12 marks)
