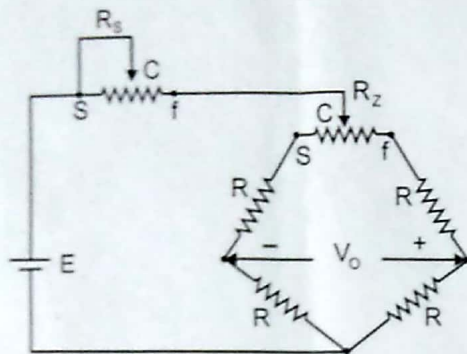


MAJOR IDP-711

24 Nov 2016 Answer all questions. Draw neat diagrams. Be brief and to the point
 Max Time: 2 hrs Max Marks: 55

Q.1 A four element strain gauge bridge with sensitivity adjustment R_s and zero adjustment R_z potentiometers is shown in figure below. The strain gauges have a nominal resistance of $R = 3500 \Omega$, and gauge factor of nominal value 3.5 and the tolerance of gauge factor is $\pm 10\%$. It is required that V_o is 35 mV at a strain = 10^{-3} (10)



What is the value of supply E, and the minimum value of sensitivity adjustment potentiometer R_s to guarantee the above sensitivity with given tolerance in gage factor? Assume that zeroing pot is already adjusted, and its value can be ignored.

Q.2 A capacitance based displacement measuring transducer has a relation between capacitance and displacement as: (10)

$$C = (10 + d \cdot 10^4) \text{ pF} \quad \text{where } 0 < d < 10^{-3} \text{ m is the displacement span.}$$

- (a) Compute the value of resonant inductor, which gives $f_0 = \frac{1}{2\pi} \times 10^7$ Hz at 0 displacement. *1 mH, 1.59 MHz*
- (b) Compute the Δf at maximum displacement.
- (c) Compute the resolution of the transducer in micron, if the least count of frequency measuring equipment is 10 Hz. *1.5 15.91 x 10^4*

Q.3

- (a) Explain the working of the precision rectifier giving circuit with diodes in their ON OFF modes and waveforms at output in both cases of +ve and -ve cycles. (4)
- (b) Explain with block diagram and waveforms the working of synchronous detector. (4)
- (c) Give 2 main reasons why synchronous detector is better than precision rectifier (2)

Q.4

- (a) With the help of a neat diagram, explain the working of an Ultrasound based flow meter? List the 2 advantages and 2 disadvantages w.r.t its application. (4)
- (b) Explain with help of a neat diagram how a 4 wire reduces lead length error compared to 2 wire RTD? (2)
- (c) With the help of neat diagram explain working of LVDT. (4)

Q.5

- (a) A photodiode has sensitivity of 1 nA/lux . Design a suitable amplifier and sensitivity adjust circuit that would give 100 mV for 100 lux. (5)
- (b) Define w.r.t. sensors: Accuracy, Precision, Systematic errors, Random errors, Gross errors (5)

Q.6

- (a) Give two major application advantages of turbine type over drag plate flow meters and vice versa. (4)
- (b) Explain working of log circuit and how anti log circuit can be made using the log circuit (6)