

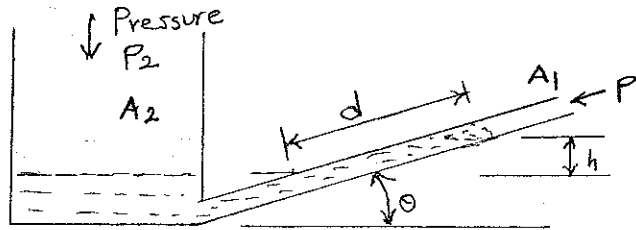
BITS, PILANI-DUBAI  
DUBAI INTERNATIONAL ACADEMIC CITY  
III Year EIE – I Semester 2011-12  
Comprehensive Examination  
TRANSDUCERS AND MEASUREMENT SYSTEMS- INSTR C381

Date: 11.1.2011  
Max.Marks:40

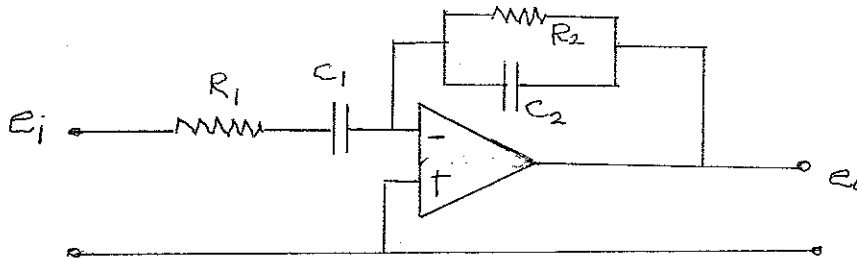
Time: 3 Hrs  
Weightage: 40 %

Answer ALL Questions  
All Questions carry Equal Marks

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1. (a) Explain a method of digital force measurement with a diagram.  
(b) How is Torque measured using a strain gauge torque table. Explain.
  2. (a) For the inclined manometer shown in the figure, derive a relation between  $P_1$ - $P_2$  and the displacement reading along the calibrated scale.



- (b) A pressurized container is leaking and as a design engineer you are asked to design a setup to detect the leaking container. Suggest a suitable setup to do this.
3. (a) Suggest and explain a method to measure the time interval between two events.  
(b) Derive the transfer function of the following differentiator.



4. (a) Suggest the block diagram of a radio telemetry system to monitor three parameters viz Temperature, Humidity and Wind velocity on a sunny day.  
(b) Explain TWO methods of measurement of liquid level in a tank by using pressure measurement.
5. Design a instrumentation system for recording pressure, temperature and percentage of oxygen in inspired air coming from a continuous positive airway.

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III Year EIE – I Semester 2011-12  
TEST2 (Open Book)  
TRANSDUCERS AND MEASUREMENT SYSTEMS- INSTR C381

Date: 18.12.2011  
Max.Marks:20

Time: 50mts  
Weightage: 20 %

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Answer ALL Questions  
All Questions carry Equal Marks

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1. Design the setup to measure the angular displacement of an aerofoil whose displacement controls the direction of an aero plane.
  2. Iron ore is being transported to the furnace and has to be continuously weighed before feeding to the furnace. Suggest a system to do this using strain gauge load cell. Show the complete set up.
  3. A U tube mercury manometer is used to measure water flow rate in a pipe. The difference in the mercury levels in two legs is 30mm.
    - (i) If the density of water is  $1 \times 10^3 \text{ kg/m}^3$  and that of mercury is  $13.56 \times 10^3 \text{ kg/m}^3$ , what percentage error is introduced by neglecting the water density in the limb.
    - (ii) What is the differential pressure being measured if the local value of  $g$  is  $9.8 \text{ m/s}^2$ .
  4. Blood flow is an important measurement to understand muscular diseases. Suggest a method measure the flow of blood. (Hint: Blood vessel can be treated as an inaccessible pipe carrying the fluid blood)

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III Year EIE – I Semester 2011-12  
TEST1  
TRANSDUCERS AND MEASUREMENT SYSTEMS  
INSTR C381

Date: 23.10.2011  
Max.Marks:25

Time: 50mts  
Weightage: 25 %

Answer ALL Questions  
Attach the semi log sheet to your answer book

1. (a) In equation

$$x_o = \frac{K_A K_M K_S}{1 + K_A K_M K_S K_F} e_i$$

$K_M = K_S = K_F = e_i = 1.0$  and  $K_A = 100$ . If  $K_M$  changes by 10% to 1.1, what is the change in  $x_o$ . Investigate a similar change of 10% in  $K_A$ . (3M)

- (b) Explain the following: (2M)  
Static sensitivity, Threshold, Resolution and Loading effect

2. Draw the frequency response plot of the transfer function

$$G(s) = \frac{1000 (s + 10)}{(s + 100)(s + 1000)}$$

(5M)

3. Give the setup and explain the method to measure larger displacements using bonded strain gages. (5M)
4. Design a complete force measuring system using LVDT. (5M)
5. Suggest a transducer and a complete system for automotive break wear analysis. (5M)

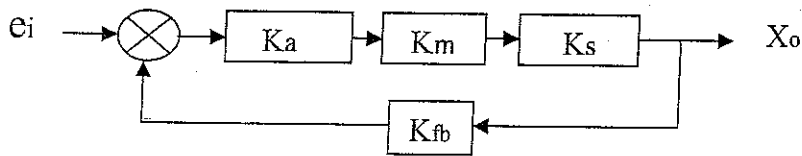




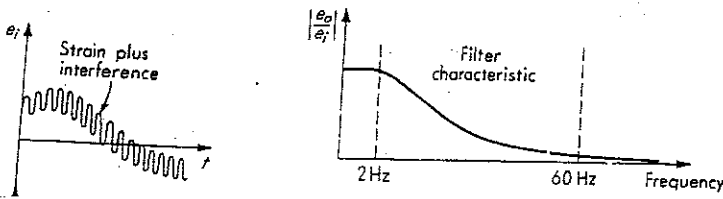


5. How are the input quantities classified.

6. Derive the condition for which the output  $X_o$  becomes independent of  $K_m$  and  $K_s$ .



7. A 2 Hz signal is superimposed by 50 Hz signal and is shown in the figure. Sketch the output if the signal is passed through a low pass filter.



8. Draw the transfer characteristics for Low pass, High pass, Band pass and Notch filters.