

General transducer

~~Explain~~ : These transducers which convert the electric quantity into a physical quantity.

Digital T. - The transducer which convert an input quantity into a digital signal or in the form of pulse.

Write selection criteria of Transducer

1. Operating principle :- The operating principle should may be resistive, inductive, capacitive, optoelectronic, piezoelectric etc.

2. Sensitivity :- The transducer must be sensitive enough to produce detectable output.

3. Reliability :- Reliability of Transducer should be high.

4. Environmental compatibility :- It should be assured that the transducer selected to work under specified environmental conditions maintain its input-output relationship.

5) Loading Effect :- The transducer should have a high input impedance and low output impedance.

1. Classification based on principle of Transduction

The transduction medium may be resistance, inductive or capacitive. On the conversion process that have input transducer converts the input signal.

2. Primary Transducer :- The mechanical device which converts physical input into a mechanical signal is called Primary Transducer.

3. Secondary Transducer :- The Secondary Transducer which change physical input quantity into a mechanical signal.

4. Passive :- The transducer which require the power from external supply source is known as passive transducer.

5. Active :- The transducer which doesn't require the external power source is known as active.

6. Analog :- The analog transducer change the input signal quantity into a continuous function.

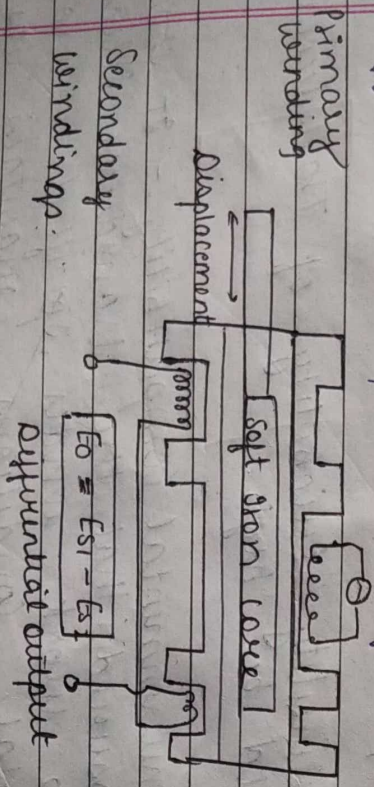
Ques write a note on LVDT.

The transformer consists of a single primary winding P and two secondary windings S_1 and S_2 .

The P is connected to a c source. A movable soft iron is placed inside the former.

Since the primary winding is excited by ac current source, it produces an ac magnetic field which in turn induces ac voltage in S_1 and S_2 .

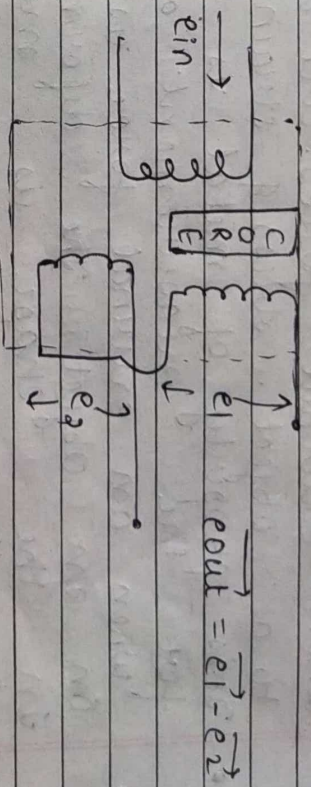
Differential output Voltage is $E_0 = E_{S1} - E_{S2}$



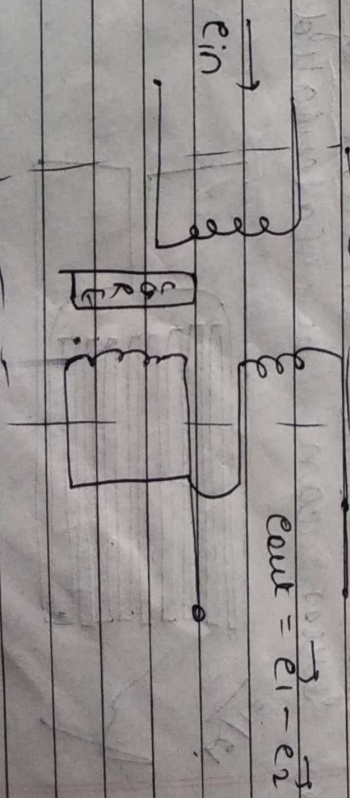
When core is at its normal, at null position $E_{S1} - E_{S2} = 0$

If core is moved up, more flux links

with winding S_1 and less with winding S_2 . Accordingly output voltage E_{S1} is more than E_{S2} . The magnitude of output voltage is thus $E_0 = E_{S1} - E_{S2} > 0$.

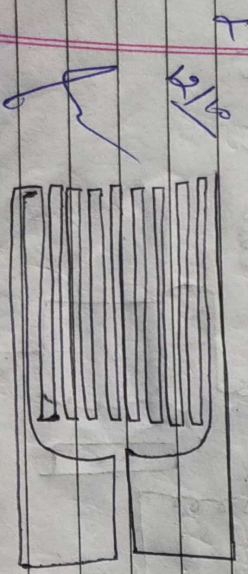


Similarly, if the core is moved to the right of the null position, the flux linking with winding S_2 becomes larger than the linking with winding S_1 . Therefore the two differential voltages are 180° out of phase with each other.



Q5 How to measure force using strain gauge.

- Strain gauge convert force into a change in electrical resistance which can then be measured.
- When external forces are applied to an object, stress & strain produce.
- This property of metal is used for the measurement of force.
- When an external force is applied on an object, the deformation in the shape is measured by the strain gauge.
- When an object deforms, there is a change in resistance and to end.
- The strain gauge is sensitive to a small change occurs in the geometry of an object. By measuring the change in resistance of an object, the amount of induced stress can be calculated.



Assignment-2

Q1 Explain Resistance Temperature Detector

- Resistance Temperature detector (RTD) also called Resistance thermometer. We use the resistance of electrical conductor for measuring the temperature.
- The resistance of the conductor varies with temperature. This property of the conductor is used for measuring temp.
- The main function of RTD is to give a positive change in resistance with temperature.
- The tip of the RTD is placed near the heat source. The heat is uniformly distributed across the sensitive element. It changes the resistance. We use the temperature of the element. The below mentioned equation measures the variation in temp.

$$R_D = R_{D0} (1 + \alpha \Delta \theta)$$

Q2 write on concept of Thermal Imaging

- Thermal imaging is a method of using infrared radiation and thermal energy to gather information about objects in order to formulate images of them, even in low visibility environments.

It is a type of technology that has built up a broad range of uses over the years - at vision is an effective form of night capability to work in the total absence of any light.

Q3 write a note on Proximity Sensor

- Proximity sensors are designed to detect without contacting the detecting object.

It has the ability to convert the observed object's movement and presence information into

Electrical Impulses

- When the object comes into its sensing area an electrical signal gets generated and this helps to detect the object.

There are many types of Proximity sensors like inductive, capacitive, ultrasonic etc.

- Proximity sensors are commonly used in industrial applications. They are used in vehicles for detecting the physical close.

Q4 write a note on Level Sensor

A level sensor is a device that is designed to monitor, maintain and measure liquid levels. Once the liquid level is detected, the sensor converts the perceived data into an electrical signal.

capacitive method for level measurement

This method is used to measure level of liquid. Two insulated aluminium rods which are kept at fixed places close to each other in a tank separated by a distance d .

$$C = \frac{\epsilon A}{d}$$

C = Capacitance in farad (F)
 ϵ = dielectric constant

A = area of two plates

d = distance b/w two plates.

55. write a note on ultrasonic flow sensor.

- An ultrasonic flow meter can be defined as the meter that is used to measure flow by using ultrasonic waves.
- This flow meter requires tiny particles within the liquid flow.

at consists of a transmitter, receiver, pipe and reflector. It uses sound waves to resolve the velocity of a liquid within a pipe.

In no flow condition, the frequencies of ultrasonic waves are transmitted into a pipe and reflected wave's frequencies is similar. So there is no frequency shift.

In flowing condition, the reflected wave frequency is dissimilar because of Doppler Effect so there is frequency change.

Whenever the liquid flows, frequency shift can be increased linearly.

The transmitter processes the signal from the wave & its reflection determines the flow rate.

