(Electronic measurement & instrumentation)

Q1 explain the working principle of LVDT?

Insulating former

Non-magnetic Rod

→ Core

S₁ (Secondary)   Primary (P)   Secondary S₂
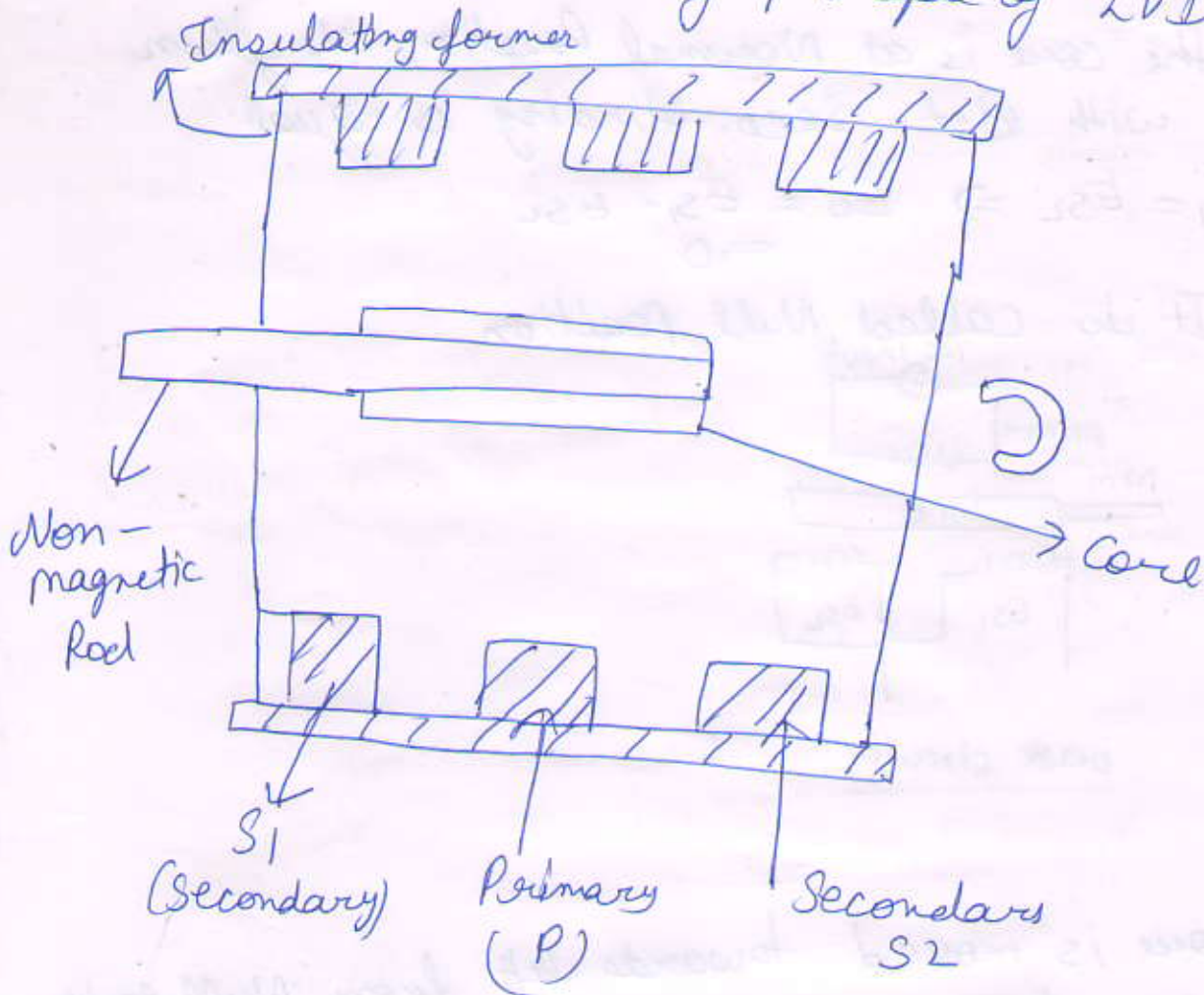
LVDT → Linear Volt Variable Differential X-ducer.
do a passive Inductive X-former.

Working → Secondary Windings are connected in phase opposition to get differential o/p. Let the o/p voltage of Secondary winding S₁ is E_{S1} & that of S₂ do E_{S2}. then the diffᵗ o/p volt. is

$$E_0 = E_{S1} - E_{S2}$$
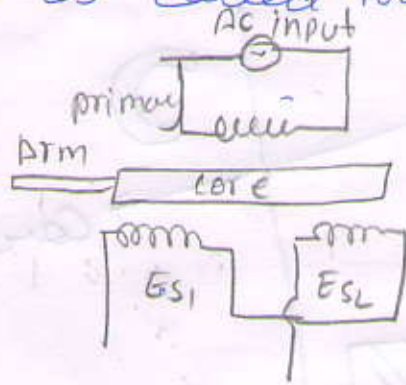
secondary

E_{in}

E_0

primary   core   B

(Sectinal view)
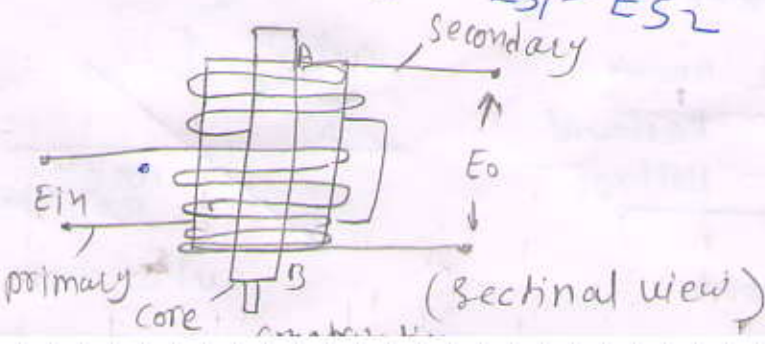
(a) When the core is at Normal Position, the flux linkage with Bot Seco. Winding is equal

$$\therefore E_{S1} = E_{S2} \Rightarrow E_0 = E_{S1} - E_{S2}$$
$$= 0$$

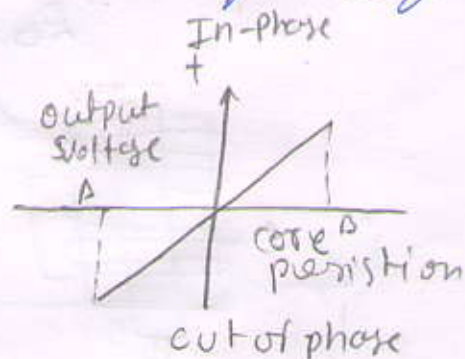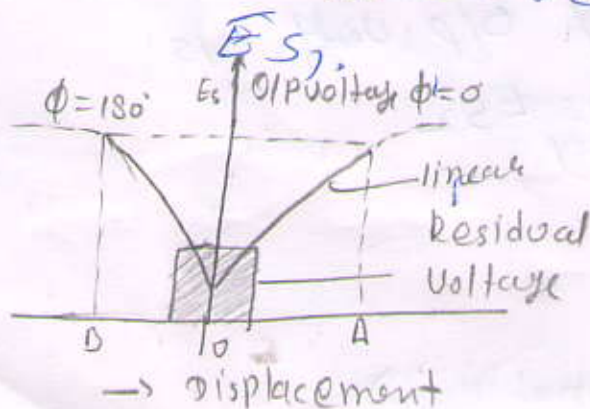It is called Null Position.

Basic circuit

(b) When Core is moved towards left from Null Position, then more flux will be linked with S_1 winding & less then S_2

$$E_{S1} > E_{S2} \Rightarrow E_0 = E_{S1} - E_{S2}$$
is in phase with E_{S1}

(c) When Core is moved towards Right from Null
$$E_{S1} < E_{S2} \text{ more flux with } S_2 \text{ than } S_1,$$
$$E_0 = E_{S1} - E_2 \text{ is } (-ve)$$
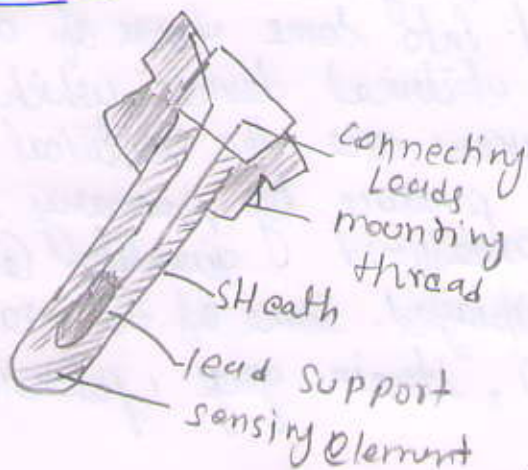$$E_0 = -ve \text{ means out of phase of}$$

Q2) Write short Note on R.T.D.

Ans→ RTD means Resistance Temperature Detector.

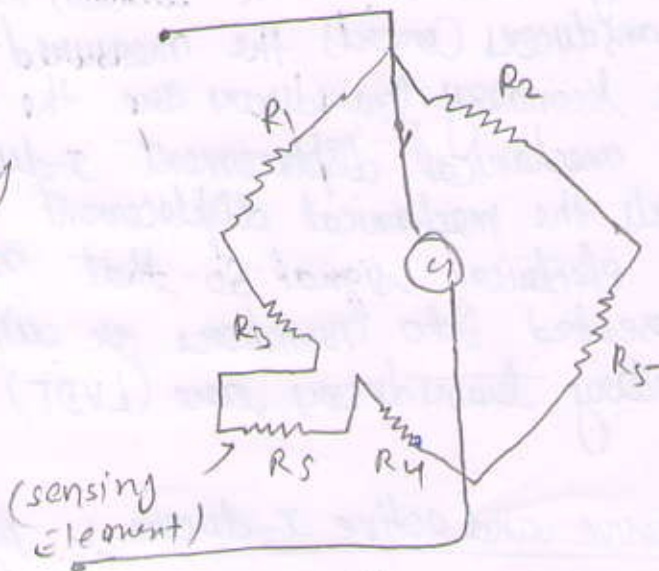"Change in Temperature brings the change in the Resistance of Conductor."

ⅰ) The Main component of RTD is its Sensing element. → i.e. Platinum, Nickel & Cu Metals.

Diagrams→

connecting Leads
mounting thread
Sheath
lead Support
sensing element

(a)

R_1 R_2
R_3 R_4
R_5 (G)
(sensing element)

(b)

The Bridge is balanced when

$$\frac{R_1}{R_2} = \frac{R_5}{R_5}$$

The Sensing element is connected to, other Resistance through leads having Res., say R_3, R_4

$$\frac{R_1}{R_2} = \frac{R_3 + R_4 + R_5}{R_5}$$

Now if Temp° ≠ the value of R_5 varies, Bridge is unbalanced & Galvanometer shows deflection, which is calibrated in terms of Temperature

Q(3) Define x-ducer. Differentiate b/w

(a) Primary - Secondary x

Ans, Transducer is a device used to convert physical signal into electrical signal.

Primary & Secondary x-ducers

Primary transducers (Primary Sensing element) are mechanical devices, which are in physical contact with the measurement, e.g spring, Bourdon tube, bellows, Diaphragm etc. and these primary transducers converts the measured into some form of displacement. The secondary transducers are the electrical devices which converts the mechanical displacement x-ducers are the electrical devices which converts the mechanical displacement produce by primary transducer into electrical signal so that measured quantity can be Represented into numbers or displayed. Some of the examples of Secondary transducers are (LVDT), strain gauge, potentiometer etc

(b) Passive and active x-ducers :- Passive transducers are externally powered transducers thus required an auxillary power source with them. They also utilies some part of the power required for conversion from the physical quantity under measurement.

An Active Transducer generates an electrical signal directly in properly to the physical parameter and does not require an external power source for its operation.