LECTURE: 31

Date.....

LIMIT, FIT, TOLERANCE and GAUGE:

Limit: The two extreme permissible size for any object is known as limit.

The minimum size is called lower limit & maximum size is called upper limit.

Nominal size:

Size of a part specified in the drawing. It is the size without limit (50mm)

Basic size:

Size of a part specified to which all limit or variation are applied.

Ex $50^{+0.005}_{-0.005}$

Actual size:

Actual measured dimensions of one part (size of single piece).

Ex. 49.995

Tolerance:

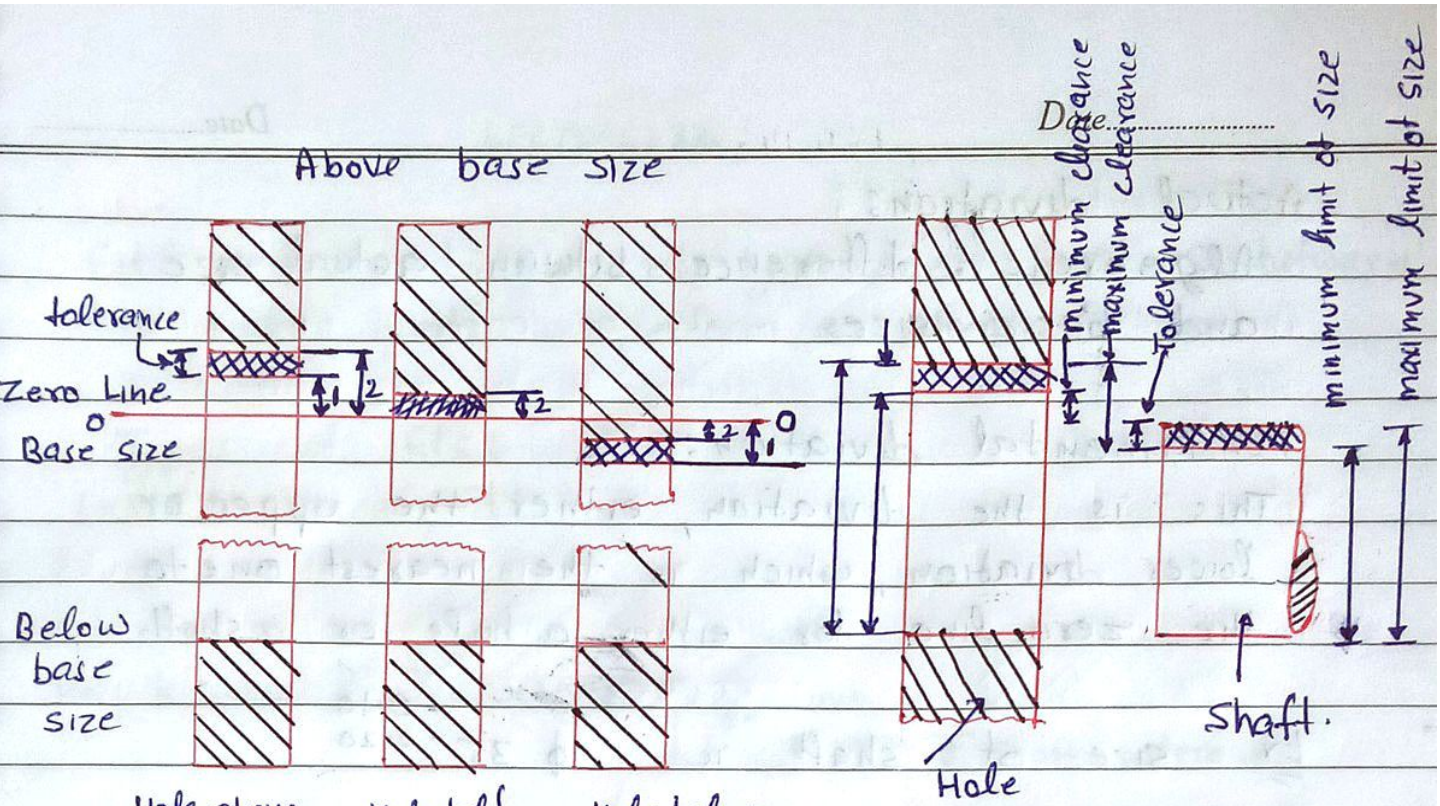
It is defined as the different between the high and low limits of size.

Tolerances are defined either as unilateral tolerance or bilateral tolerance.

Unilateral tolerance : $50^{+0.005}_{-0.000}$, $50^{+0.000}_{-0.002}$

Bilateral tolerance : $50^{+0.10}_{-0.10}$

Date.....



1* - lower deviation

2* - upper deviation.

Zero line:

A straight line corresponding to the basic size The deviations are measured from this line.

Deviation:

It is algebraic difference between a size (max, min & actual) and the corresponding base size.

Upper deviation: Algebraic difference between maximum size and base size.

Lower deviation:

Algebraic difference between minimum size and base size.

Date.....

Actual deviation:
Algebraic difference between actual size and basic size.

Fundamental deviation:
This is the deviation, either the upper or lower deviation, which is the nearest one to the zero line for either a hole or a shaft.

Ex. size of shaft is $\phi 35^{-0.10}_{-0.20}$

Base size = 35
Maximum size = 35 − 0.10 = 34.9
minimum size = 35 − 0.20 = 34.8
U.D = 35 − 34.9 = 0.10
L.D = 35 − 34.8 = 0.20
F.D = 0.10
Tolerance = maximum size − minimum size
= 34.9 − 34.8 = 0.10

Clearance:
The distance between the size of a hole and a shaft which are to be assembled together when the shaft is smaller than the hole.

Interference:
The distance between the size of a hole and a shaft which are to be assembled together when the shaft is larger than the hole.

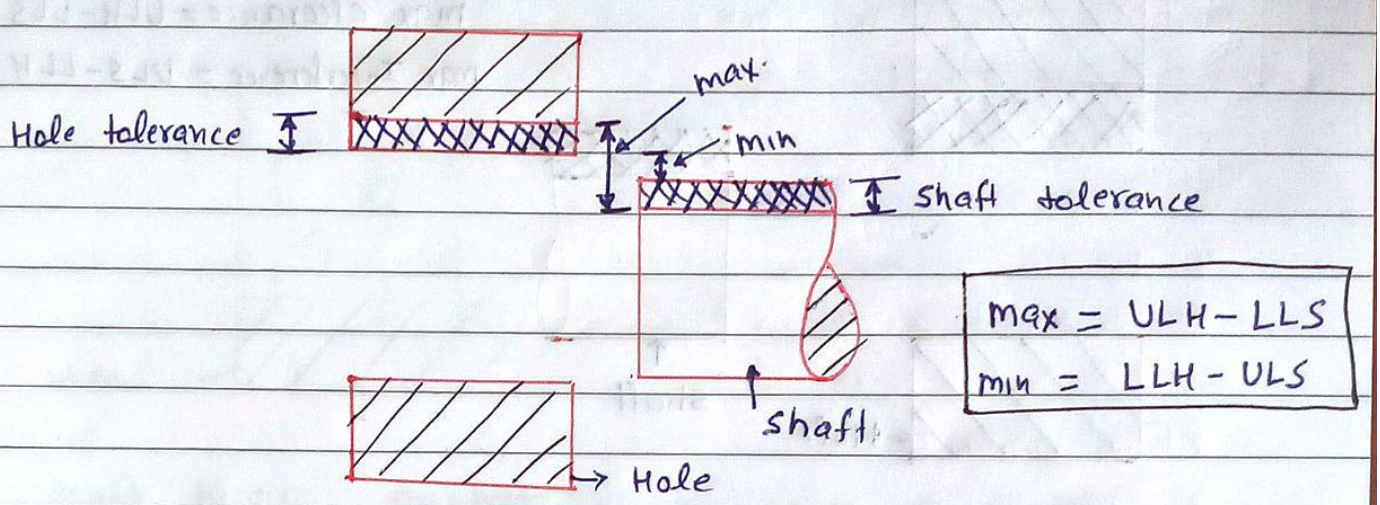
LECTURE: 32 Date.....

Fit:

Fit means a degree of tightness or looseness between two mating parts to perform a definite function.

Types of fits:

1- Clearance fit:

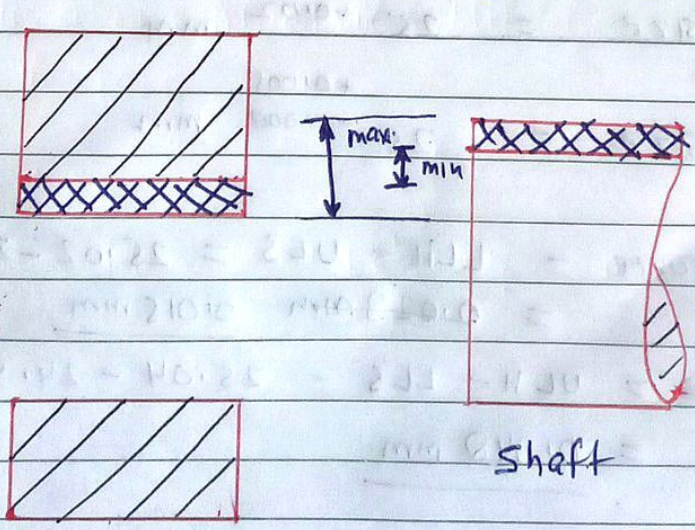


max = ULH − LLS
min = LLH − ULS

When the maximum size of ~~hole~~ shaft is smaller than the minimum size of hole then the fit is called clearance fit. Ex- Piston - Cylinder

2- Interference fit:

When the maximum size of hole is smaller than the minimum size of shaft then the fit is called Interference fit. Ex. Railway weagon wheel & axele.



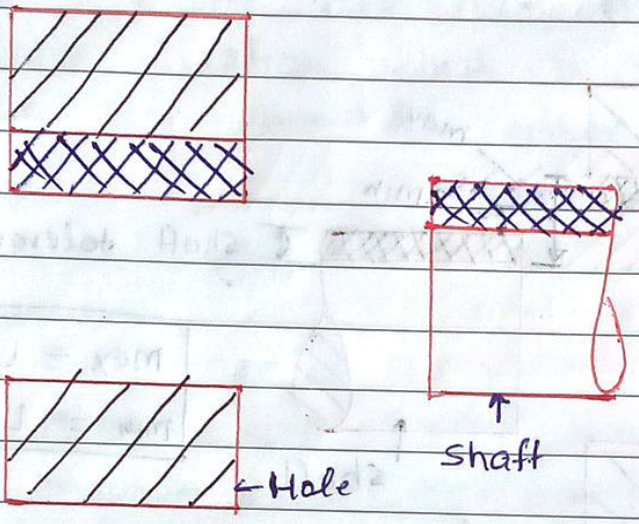
max = ULH − LLS
min = LLS − ULH

Spiral

Date.....

3- Transition's fit:

When the maximum size of shaft is greater than the minimum size of hole & the max size of hole is greater than minimum size of shaft. Ex. shaft & pully



max. clearance = ULH - LLS

max. Interference = ULS - LLH

Allowance:

The difference between the maximum shaft and minimum hole is known as ~~hole~~ allowance.

In the clearance fit, this is minimum clearance & positive allowance.

In an interference fit, it is the maximum interference and is a negative allowance.

Ex. Hole size = $25^{+0.04}_{+0.02}$ mm

Shaft size = $25^{+0.005}_{-0.000}$ mm

min. clearance = LLH - ULS = 25.02 - 25.005

= ~~0.028 mm~~ 0.015 mm

max. clearance = ULH - LLS = 25.04 - 24.992

= 0.048 mm.

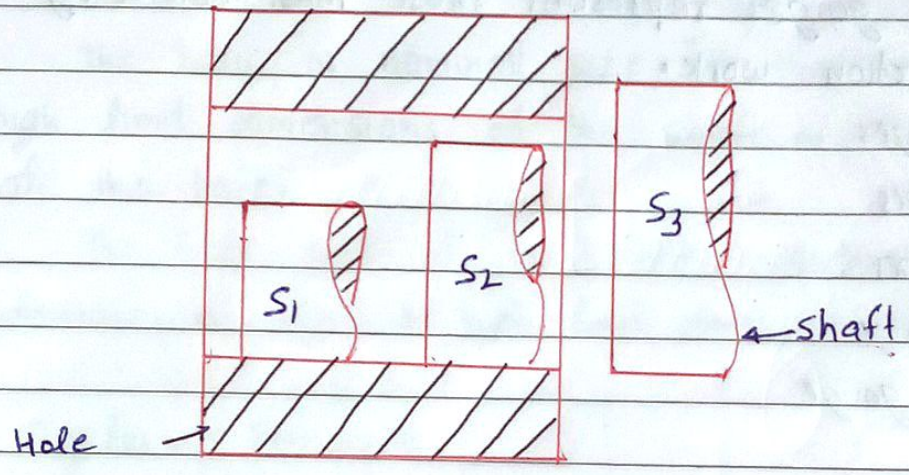
Date.....

Basis of fit (or Limit) system:

Hole bases system:

The hole is act as a constant member [The lower deviation of hole is zero] & size of shaft is varying.

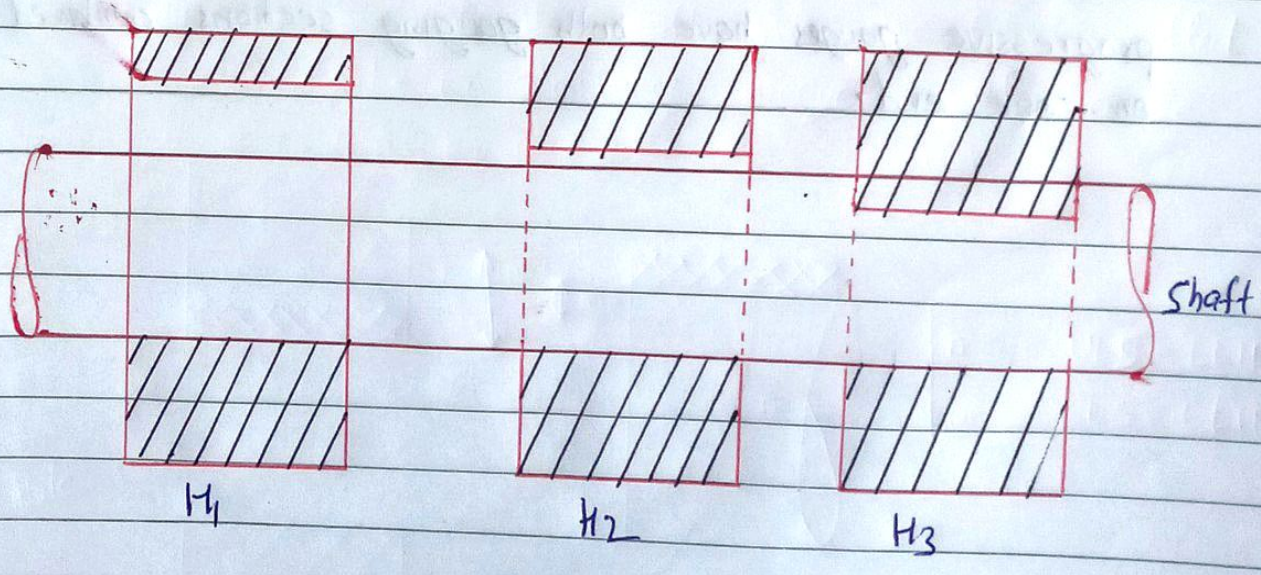
The basic size of hole is taken as lower limit of holesize.



Shaft basis system:

The shaft act as a constant member [the upper deviation of shaft is zero) and the variation necessary to obtain the classes of fit are arranged by varying the limits on the hole.

Basic size of the shaft is taken upper limit of the shaft.



LECTURE: 33 Date.....

Gauge:

A gauge is tool or instrument used to measure or compare a component.

Classification of gauge:

The following gauges represent those most commonly used in production work.

1- Snap gauges
2- Plug gauges
3- Ring gauges
4- Length gauge
5- Thickness gauge

Plug gauge:

A plain plug gauge is an accurate cylinder used as an internal gauge for size control of holes. It is provided with a suitable ~~of~~ handle for holding and is made in a variety of styles. These gauge may be either single or double ended.

Double ended, plain gauge have "Go" and "Not Go" members assembled on opposite ends, whereas ~~progra~~ progressive gauges have both gauging sections combined on one end.

Date.....

Limit Gauge:

Limit gauges are 'Go' and 'Not Go' type.

The Go side of limit gauges should enter the hole or just pass over the shaft under the weight of the gauge without using any force.

The 'Not-Go' side of the gauge must not enter or pass.

The basic or nominal size of the 'Go' side is the high limit dimensions of the shaft or the low limit dimensions of the hole.

The basic size of the 'Not-Go' side is low limit dimension of shaft or high limit dimension of the hole.

Taylor's Principle:

'Go' and 'Not-Go' gauges must full fill Taylor's principle. It state that "On the 'Go' code of the limit gauge, all the dimensions should be checked simultaneously, while on the 'Not-Go' side each dimension is to be checked separately.