**TOPIC : 2.1.INTRODUCTION AND APPLICATION OF INTERPOLATION AND APPROXIMATION**

Interpolation

Interpolation is a technique of finding new data points within the range of known data points. Linear interpolation is the simplest method of getting values at positions in between the data points. The points are simply joined by straight line segments.

It is basically the process of estimating the outcomes in between sampled data points. In linear interpolation a line connecting two points is used to estimate intermediate values

Interpolation formula
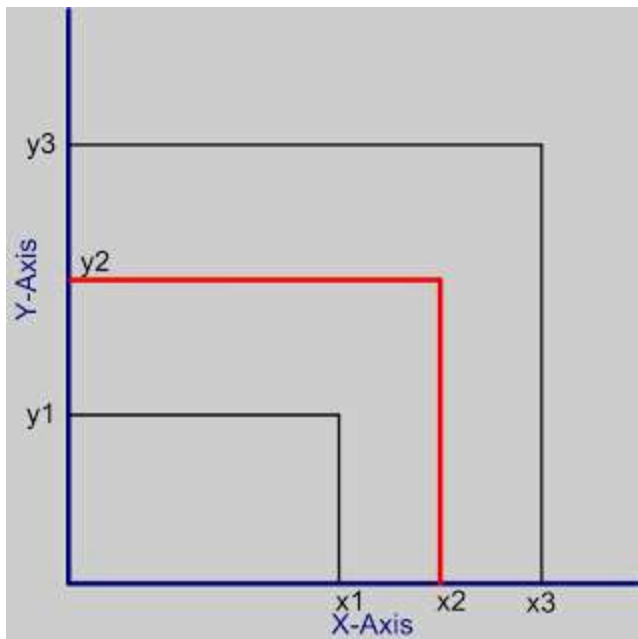
In the graph above you have got the values of x1, x3, y1 and y3. Now you want to interpolate the value of y2 at any given value of x2 so you can use the simple interpolation formula given below

$$Y2 = \underline{(x2\text{-}x1)\ (y3\text{-}y1)} + y1$$

$$(x3\text{-}x1)$$

Application of interpolation

A spring is an elastic object used to store mechanical energy. In case of mechanical spring there is a spring load and deflection graph. The deflection is in millimeters and the load is measured in newton. The deflection is plotted on the x-axis and the corresponding load in newton on y-axis. Often we have to find the values between the two sets of values (load vs. deflection). Hence interpolation is the technique used to find the unknown values. The graph is usually plotted in excel.
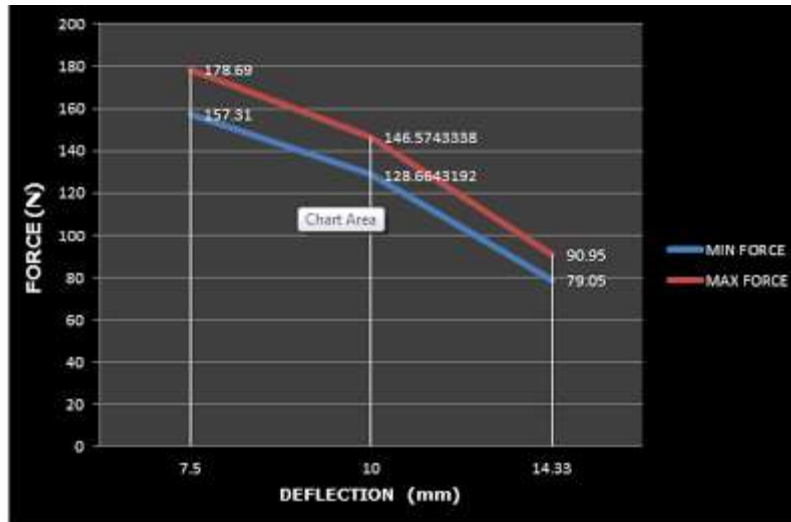
mm	Min force	Max force
7.5	157.31	178.69
10	128.6643192	146.5743338
14.33	79.05	90.95

The figure above shows the spring deflection at values of 7.5 and 14.33mm and the corresponding load. One is the graph for minimum load values shown in blue (157.31 and 79.05). The other graph shown in red is for the maximum force values (178.69 and 90.95). Now we want to find the load values at deflection of 10mm which is done using excel 2010 and using interpolation formula