Sheet 4: Bending Stresses

1- A bending test was carried out on a steel beam having a cross section 4×8 cm and 80 cm span length. The beam is **centrally loaded**, the load (P), and the middle deflection (y) were as follows:

P (kg)	200	400	600	800	920	880	910	1000	1350	1600	1750	1800	1810	1750	1600
y (mm)	0.5	1	1.5	2	2.15	2.3	2.4	2.5	3	3.5	4	4.5	5	5.5	6

Draw the load deflection diagram and determine:

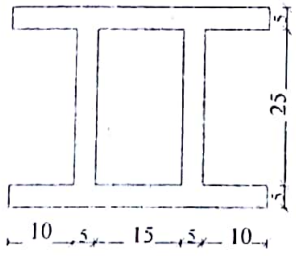
- Proportional limit stress.
- Modulus of rapture.
- Modulus of resilience.
- Modulus of elasticity.
- Elastic energy stored in beam.

2- A simply supported beam with a rectangular cross section X×Y, loaded by a distributed load **W** along its span L.
How is the stresses changed by reducing to half each of :

- Distributed load **W**.
- Width of the beam.
- Length of span.
- Depth of the beam.

3- Bending test was carried out on a beam having II-cross section as shown in figure, the beam is simply supported at point's 500 cm apart, with **two-third points loading**. Strain gauge were attached to the beam at the maximum deflection location. If the modulus of elasticity is 8×10^5 kg/cm^2.

- what load is required to give strain reading of 0.003 ?
- the maximum elastic deflection.
- Elastic strain energy stored in beam.



4- Determine the cross section dimensions of a 2.50 m simply supported beam with two point loads applied at the **fourth points** under a total load of 4 tons and a distributed load equal 1.5 t/m. the modulus of rupture is 800 kg/cm^2, with a depth equal to four times the width. Use design stress based on the modulus of rupture with a factor of safety equals 3.