

Assignment 4.

1. A safety valve for a pressure system has a discharge hole of 50 mm diameter. the spring has a free length of 250 mm and a spring constant of 120 kN/m. At what pressure will the valve open?

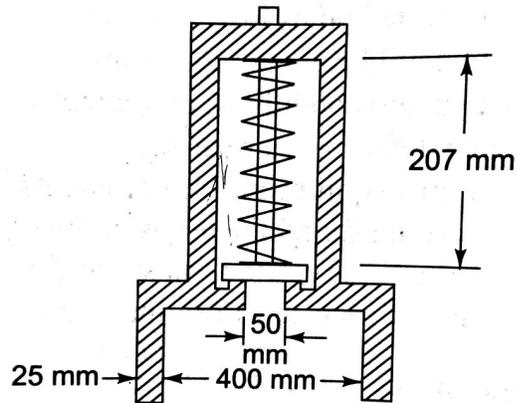


Figure 1

2. A square reinforced concrete pier 0.3 x 0.3 m in cross section and 1.2 m high is loaded as shown in the figure. the concrete is strengthened by the addition of wight vertical 25 mm x 25mm square steel reinforcing bars placed symmetrically about the vertical axis of the pier. Find the stress (force/ unit area) in the steel and concrete. Take $E = 17 \text{ GPa}$.

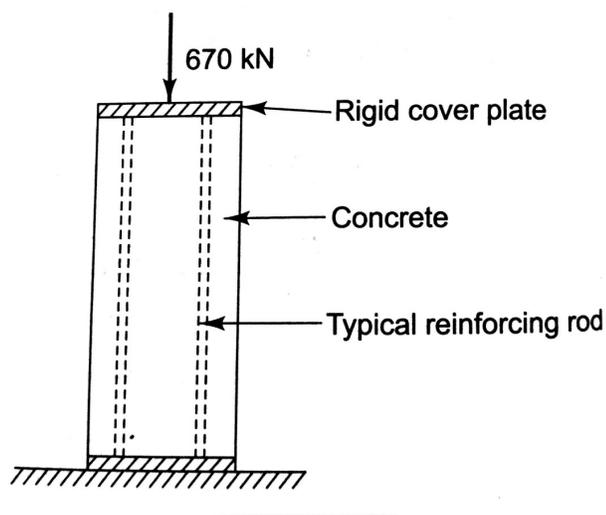


Figure 2

3. In figure 2 find the deflection. Take $E = 17 \text{ Gpa}$.
4. A very stiff horizontal member is supported by two vertical steel rods of different cross sectional area and length. If a vertical load of 120 kN is applied to the horizontal beam at point B, estimate the vertical deflection of the point B.

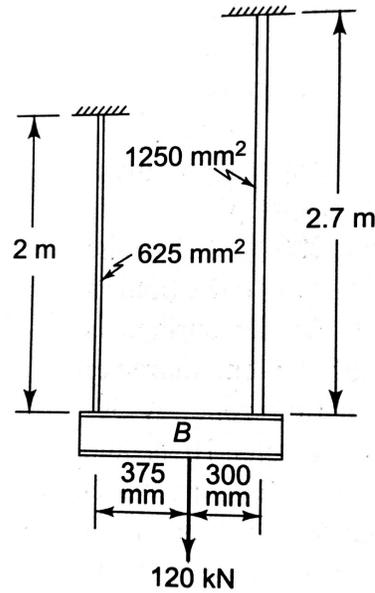


Figure 3

5. In the structure shown in the figure 4 (a) the member AB is rigid in comparison to BC. It is desired to estimate the vertical deflection at B when a load of 400 N is supported at B. It is known that when the 400 N load is supported entirely by BC as shown in figure 4(b), the deflection at B is 23 mm .

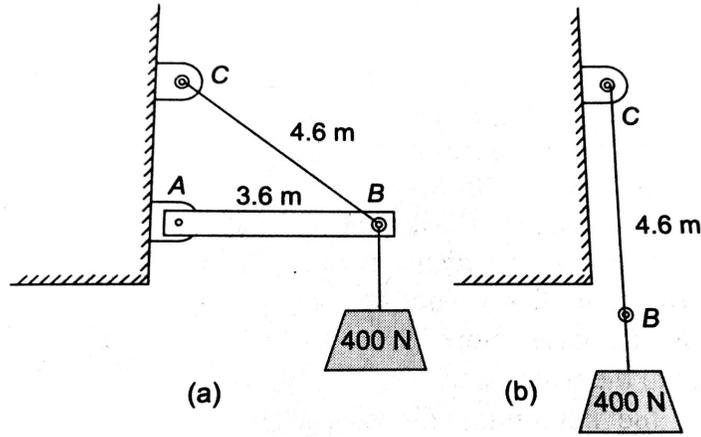


Figure 4

6. High speed rail transportation design requires a knowledge of deflection characteristics of the various components of the roadway. If the member AB of a truss section as shown in figure 6 is rigid, estimate the angle (in radians) the member AB makes with the horizontal when a load acts at the position indicated. Bars AC, BC, and BD are steel with the cross sections indicated in figure 6.

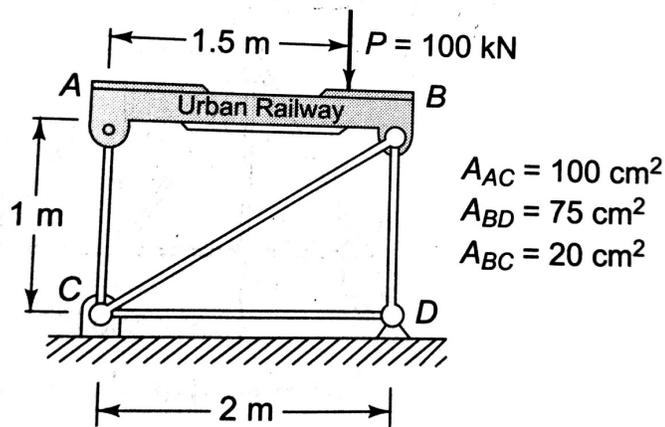


Figure 5

7. A stiff beam is hinged at one end and supported by two springs of spring constant k .
Where should a force P be applied so that the spring constant of system (P divided by the deflection under P) is $20/9 k$?

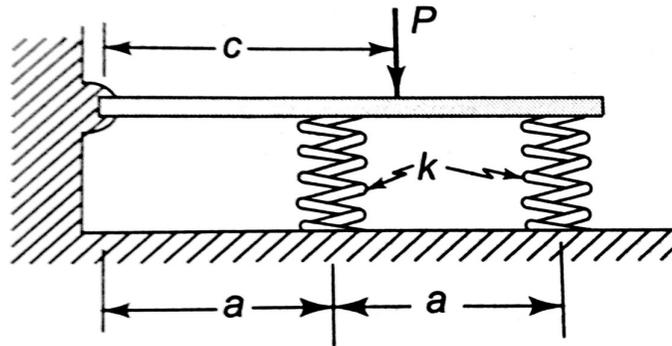


Figure 6