FAQs

1. Find the moment of resistance of the T-beam of effective depth 600mm and flange width 1500mm. Depth of flange is 150mm. Tensile steel is1964mm^2. Compression steel of 1140mm^2 is placed 50mm from the top of the beam. Use σ_{cbc} = 7 N/mm^2; σ_{st} = 230 N/mm^2.

   To find x_c

   $$\boldsymbol{\sigma_{cbc} / \sigma_{st}/m = x_c / d\text{-}x_c}$$

   x_c = 173.16mm

   Assume case (ii) when x > D_f

   To find x

   $$\mathbf{b_f\, x.x/2 + (1.5m\text{-}1)\, A_{sc}\, (x\text{-}d^1) = m\, A_{st}(d\text{-}x)}$$

   x = 119.5mm < D_f

   and also x < x_c ; it is under reinforced section; $\boldsymbol{\sigma_{st}}$ is known

   To find actual **σcbc**

   $$\boldsymbol{\sigma_{cbc} / \sigma_{st}/m = x_c / d\text{-}x_c}$$

   actual $\boldsymbol{\sigma_{cbc}}$ = 4.29 N/mm^2 < 7 N/mm^2

   To find **σcbc^1**

   $$\mathbf{\sigma cbc^1 = \sigma cbc\, (x - d^1)/x = 2.495}\ \text{N/mm}^2$$

   To find M_r

   $$\mathbf{Mr = C\, X\, z = b_f\, x\, \sigma_{cbc}/2\, (d\text{-}x/3) + (1.5m\text{-}1)\, A_{sc}\sigma_{cbc}{}^1(d\text{-}d^1)}$$

   Mr = 245.09 kNm

2. A T beam has a permissible flange width of 1300mm, effective depth of 500mm, the thickness of floor 100mm. The beam is reinforced on tension side with 1570mm^2 of steel and on compression side with 1256mm^2 of steel. Calculate the moment of resistance of beam. Take σ_{cbc} = 5 N/mm^2; σ_{st} = 275 N/mm^2 and d'=30mm.

   To find x_c

   $$\boldsymbol{\sigma_{cbc} / \sigma_{st}/m = x_c / d\text{-}x_c}$$

   x_c = 126.66mm

   case (i) when x ≤ D_f

   $$\mathbf{b_fD_f(x\text{-}D_f/2) + b_w(x\text{-}D_f)(x\text{-}D_f/2) + (1.5m\text{-}1)\, A_{sc}\, (x\text{-}d^1) = mA_{st}(d\text{-}x)}$$

   x = 114.7mm > D_f

   and also x < x_c ; it is under reinforced section; $\boldsymbol{\sigma_{st}}$ is known

To find actual **σcbc**

σ_{cbc} / $\sigma_{st}/m = x_c / d - x_c$

actual σ_{cbc} = 4.387 N/mm^2 < 5 N/mm^2

To find **σcbc¹**

$\sigma cbc^1 = \sigma cbc\ (x - d^1)/x$ = 3.24 N/mm^2

To find **σcbc¹¹**

$\sigma cbc^{11} = \sigma cbc\ (x - D_f)/x$ = 0.56 N/mm^2

To find Y

Y = 36.93mm

To find M_r

$M_r = C \times z = b_f D_f\ (\sigma_{cbc}+\sigma_{cbc}^{11})/2\ (d-Y) + (1.5m-1)\ A_{sc}\sigma_{cbc}{}^1(d-d^1)$

M_r = 201.314 kNm