## FAQs

1. Compute the ultimate moment of resistance of a T-beam with the following data. Width of flange = 1100mm; Depth of flange = 120mm; Width of rib = 275mm; Effective depth = 450mm; Ast = 2700mm$^2$; Materials = M25 and Fe500.

   To find $x_u$

   Assume case (i) $\mathbf{x_u \leq D_f}$

   **@ N.A** $\mathbf{C_u = T_u}$

   $\mathbf{0.36 f_{ck} x_u b_f = 0.87 f_y A_{st}}$

   $\mathbf{x_u = 0.87 f_y A_{st} / 0.36 f_{ck} b_f}$

   $\mathbf{x_u = 118.636mm \leq D_f}$

   The assumption is correct.

   To find $x_{u,lim}$

   $\mathbf{x_{u,lim} = 0.456d}$

   $\mathbf{= 205.20mm}$

   here $\mathbf{x_u} < x_{u,lim}$ ; it is under reinforced section

   To find $M_u$

   $\mathbf{M_u = T_u \times z}$

   $\mathbf{= 0.87 f_y A_{st} (d - o.416 x_u)}$

   $\mathbf{= 470.56\ kNm}$

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2. Compute the ultimate moment of resistance of a T-beam with the following data. Width of flange = 1500mm; Depth of flange = 100mm; Width of rib = 300mm; Effective depth = 600mm; Ast = 4500mm$^2$; Materials = M20 and Fe415.

   To find $x_u$

   Assume case (i) $\mathbf{x_u \leq D_f}$

   **@ N.A** $\mathbf{C_u = T_u}$

   $\mathbf{0.36 f_{ck} x_u b_f = 0.87 f_y A_{st}}$

   $\mathbf{x_u = 0.87 f_y A_{st} / 0.36 f_{ck} b_f}$

   $\mathbf{x_u = 150.44mm > D_f}$

   The assumption of wrong; hence case (ii)

   Case (ii) $\mathbf{x > D_f}$ **and** $\mathbf{0.43 X_u \geq D_f}$

   To find $x_u$

   **@ N.A** $\mathbf{C_u = T_u}$

$$0.36f_{ck}x_u b_w + 0.446f_{ck}D_f(b_f - b_w) = 0.87f_y A_{st}$$

$x_u$ = **256.63mm > $D_f$**

**0.43$X_u$ =** **115.94mm > $D_f$** hence case (ii)

To find $M_u$

$M_u = C_{uw} \times z_1 + C_{uf} \times z_2$

$= 0.36f_{ck}x_u b_w (d - 0.416x_u) + 0.446f_{ck}D_f (b_f - b_w)(d - D_f/2)$

**= 862.13 kNm**

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3. Compute the ultimate moment of resistance of a T-beam with the following data. Width of flange = 1250mm; Depth of flange = 100mm; Width of rib = 250mm; Effective depth = 650mm; Ast = 2800mm$^2$; Materials = M20 and Fe415.

To find $x_u$

Assume case (i) $x_u \leq D_f$

@ N.A $C_u = T_u$

$0.36f_{ck}x_u b_f = 0.87f_y A_{st}$

$x_u = 0.87f_y A_{st} / 0.36f_{ck}b_f$

$x_u$ = **112.33mm > $D_f$**

The assumption of wrong; hence case (ii)

Case (ii) $x > D_f$ **and** $0.43X_u \geq D_f$

To find $x_u$

@ N.A $C_u = T_u$

$0.36f_{ck}x_u b_w + 0.446f_{ck}D_f(b_f - b_w) = 0.87f_y A_{st}$

$x_u$ = **66.07mm < $D_f$**

hence try for case (iii)

Case (iii) $x > D_f$ **and** $0.43X_u < D_f$

To find $x_u$

@ N.A $C_u = T_u$

$0.36f_{ck}x_u b_w + 0.446f_{ck}Y_f(b_f - b_w) = 0.87f_y A_{st}$

**where,** $Y_f = (0.15x_u + 0.65D_f) < D_f$

$x_u$ = **104.19 > $D_f$**

**0.43$X_u$ =** **44.80mm < $D_f$** hence case (iii)

To find $M_u$

$$M_u = C_{uw} \times z_1 + C_{uf} \times z_2$$

$$= 0.36 f_{ck} x_u b_w (d - 0.416 x_u) + 0.446 f_{ck} Y_f (b_f - b_w) (d - Y_f/2)$$

$$= 552.27 \text{ kNm}$$