FAQs

1. Write the expression to find the total compressive force offered by the concrete

   $$\mathbf{C_u = 0.36 f_{ck} x_u b}$$

2. Write the expression to find the total tensile force offered by the steel

   $$\mathbf{T_u = 0.87 f_y A_{st}}$$

3. Give the distance of C.G total compressive force from top of compressive stress block

   $$\mathbf{Y = 0.416\ X_U}$$

4. Ultimate moment of resistance (M_u) of singly reinforced rectangular section

   $M_u = T_u \times z$

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

   $M_u = C_u \times z$

   $\mathbf{= 0.36 f_{ck} x_u b(d\text{-}0.416 x_u)}$

5. Give the limiting values of ultimate moment of resistance

Steel Type	f_y (N/mm^2)	X_{ulim}	$M_{u,lim}$
Mild Steel	250	0.531d	$0.149 f_{ck} bd^2$
Fe415	415	0.479d	$0.138 f_{ck} bd^2$
Fe500	500	0.456d	$0.133 f_{ck} bd^2$

6. Find the M_u of the rectangular beam of size 300mm x 650mm effective which is reinforced with 942mm^2 of steel at tension side. Use M20 concrete and Fe415 steel.

   To find x_u

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

   $\mathbf{x_u = 157.46mm}$

   To find $x_{u,lim}$

   $\mathbf{x_{u,lim} = 0.479d}$

   $\mathbf{x_{u,lim} = 311.35mm}$

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

   To find M_u

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

   $\mathbf{M_u = 198.72\ kNm}$

7. Find the M_u of the rectangular beam of size 225mm x 700mm effective which is reinforced with 1100mm^2 of steel at tension side. Use M20 concrete and Fe500 steel.

To find x_u

$$x_u = 0.87f_yA_{st} / 0.36f_{ck}b$$

$$x_u = 295.37mm$$

To find $x_{u,lim}$

$$x_{u,lim} = 0.479d$$

$$x_{u,lim} = 319.20mm$$

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

To find M_u

$$M_u = 0.87f_yA_{st}(d-o.416x_u)$$

$$M_u = 276.15\ kNm$$