Q7 * Design of Flanges.

$$A_f = \dfrac{M}{dw \times f_b} - \dfrac{A_{wes}}{6} = \dfrac{408140}{350 \times 2.1} \leftarrow \dfrac{1.8 \times 350}{6} = 450.3 \ cm^2$$

$b_f = (0.2 \sim 0.3) \ dw = 0.7 \sim 1.05 \ m$ take $b_f = 1 \ m$
 $\& \ t_f = 5 \ c.$

* check of local buckling

$$\dfrac{c}{t_f} = \dfrac{1000}{2 \times 50} = 10 < 11 \quad : OK.$$
$$(21/\sqrt{f_y})$$

Qu 7

$Q_y = 416.03 t$

$M_x = 4081.4 tm$

$I_x = 2\left[\dfrac{100(5)^3}{12} + 100*5*177.5^2\right]$

$+ \dfrac{1.8 \times 350^3}{12} = 37939583.3 \, cm^4$

$2x = \dfrac{I_x}{y} = 210775.5 \, cm^3$

$f_{act} = \dfrac{M_x}{Z_x} = \dfrac{408140}{210775.5} = 1.94 \, t/cm^2$

$L_u = 1.25 * 2.5 = 3.125 m = 312.5 cm \longrightarrow$ bracket

$F_1 = \dfrac{800 \, A_f \, C_b}{L_u * d} = \dfrac{800 * 100 \times 5 * 1}{312.5 * 350} = 3.66 \, t/cm^2 > \begin{array}{l} 2.1 \, t/cm^2 \\ 0.58 \, f_y \end{array}$

∴ $f_{au} = 0.58 f_y = 2.1 \, t/cm^2 > f_{act}$ ∴ safe bending

$\longrightarrow$ check deflection :

let $M_u = \dfrac{weg \, l^2}{8} \Rightarrow 2251.3 = \dfrac{weg * 40^2}{8}$

$\longrightarrow weg = 11.26 \, t/m'$

$\Delta_{act} = \dfrac{5 * \dfrac{11.26}{100} \times 4000^4}{384 \times 2100 \times 37939583.3} = 4.71 cm$

$\Delta_{au} = \dfrac{4000}{800} = 5 cm$ ∴ safe deflection