

Q22

$Q_{max} = 74 \text{ t}$ $M_{max} = 200.12 \text{ mt}$

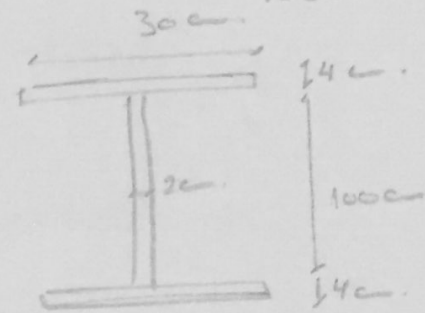
Use BUS:

$Z_{req} = \frac{M}{\sigma_{all}} = \frac{200.12 \times 100}{1.54} = 12994.81 \text{ cm}^3 \Rightarrow \frac{300 \times 40}{1000 \times 70}$

concrete slab $\therefore L_u = 0$

→ check compactness:

symmetrical
 $\frac{d_w}{t_w} = \frac{100}{2} = 50 < \frac{127}{f_y}$
 $\frac{c}{t_f} = \frac{(30-2)/2}{4} = 3.5 < \frac{15.3}{f_y}$
 $L_u = 0 < L_{u1} \& L_{u2}$
 \therefore compact
 $\therefore \sigma_{all} = 1.54 \text{ t/cm}^2$



$I_x = 815946.7 \text{ cm}^4$
 $Z_x = 15110.1 \text{ cm}^3$
 $A = 4400 \text{ cm}^2$

$\sigma_{bx} = \frac{M_x}{Z_x} = \frac{200.12 \times 100}{15110.1} = 1.32 \text{ t/cm}^2 < 1.54 \text{ t/cm}^2 \therefore$ safe in flexure.

$\Rightarrow \tau_{act} = \frac{q}{0.85(2 \times 100)} = \frac{74}{170} = 0.44 \text{ t/cm}^2 < 0.84 \text{ t/cm}^2$
 \therefore safe in shear.

→ check deflection:

let $M_{u_{max}} = \frac{w_{eq} L^2}{8} \Rightarrow 118.3 = \frac{w_{eq} \times 10^2}{8} \Rightarrow w_{eq} = 9.46 \text{ t/m}$

$\Delta_{act} = \frac{5 w L^4}{384 E I} = \frac{5 \times (9.46/100) \times (1000)^4}{384 \times 2100 \times 815946.7} = 0.72 \text{ cm}$

$\Delta_{all} = \frac{L}{800} = \frac{1000}{800} = 1.25 \text{ cm}$

\therefore safe deflection.