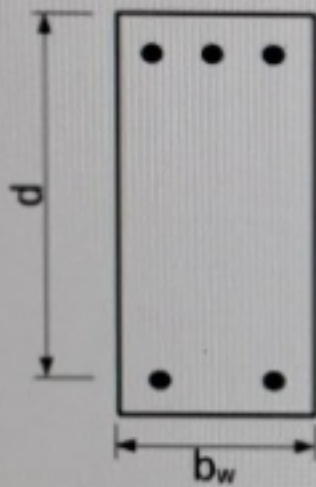


Civil Engineering

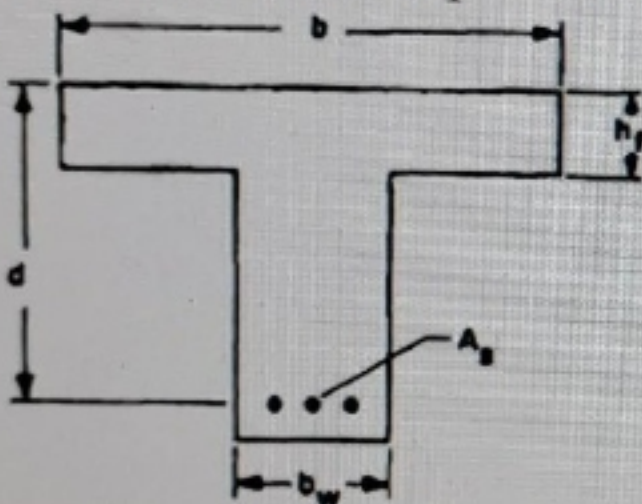
2 -

The section of a beam near a column is given below. Area of the top reinforcement is 800 mm^2 and bottom reinforcement is 300 mm^2 . Is the section under or over-reinforced if the balanced reinforcement ratio is $\rho_b = 0,0209$?
 $b_w = 200 \text{ mm}$ $d = 300 \text{ mm}$



- a) ☐ Under-reinforced since $800 \text{ mm}^2 < A_{sb}$
- b) ☐ Under-reinforced since $300 \text{ mm}^2 < A_{sb}$
- c) ☐ Under-reinforced since $800 - 300 \text{ mm}^2 < A_{sb}$
- d) ☐ Over-reinforced since $800 - 300 \text{ mm}^2 > A_{sb}$
- e) ☐ Over-reinforced since $300 \text{ mm}^2 > A_{sb}$

What is the distance of the neutral axis c from the top of the beam, if the top portion of the beam is in compression. Concrete is C30, longitudinal steel bars are $\phi 16$ and made of B420C steel. Use design strengths in your computation. $b = 800 \text{ mm}$, $d = 500 \text{ mm}$, $h_f = 100 \text{ mm}$, $b_w = 300 \text{ mm}$. Hint: For C30 concrete $k_1 = 0.82$.



- a) ☐ 53 mm
- b) ☐ 46 mm
- c) ☐ 20 mm
- d) ☐ 32 mm
- e) ☐ 26 mm