SNS COLLEGE OF TECHNOLOGY

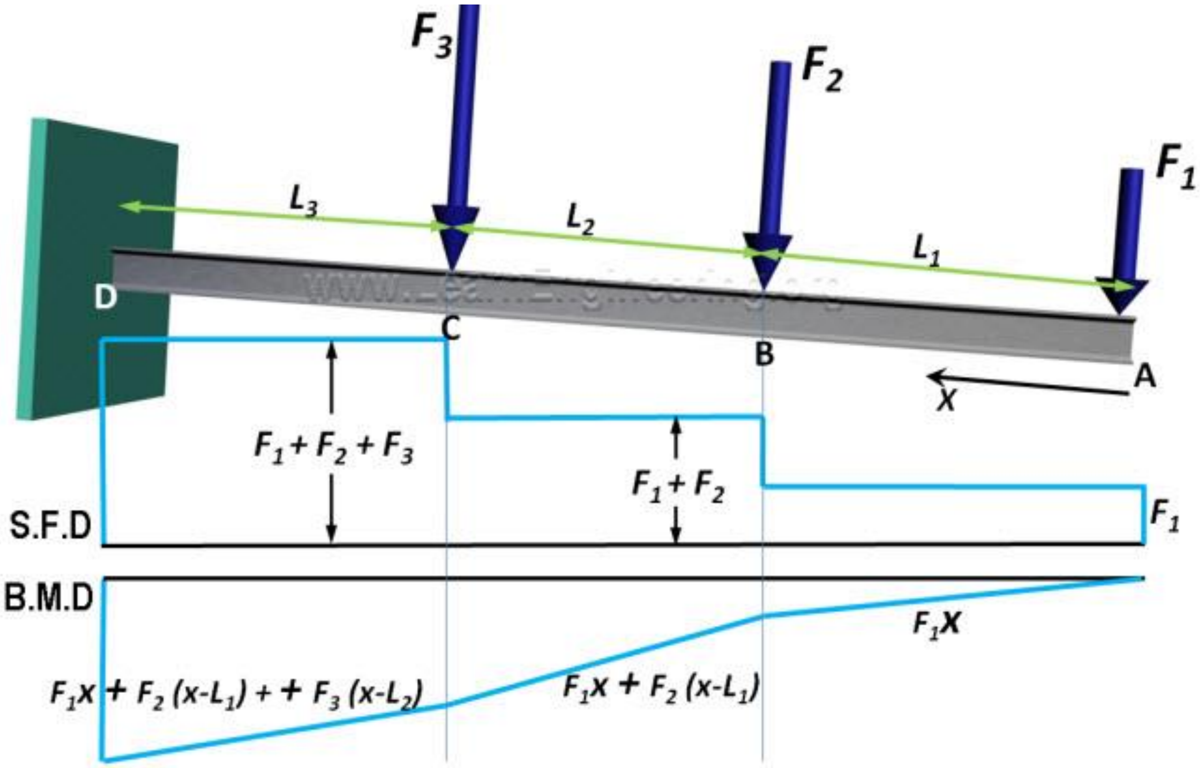
(An Autonomous Institution)

DEPARTMENT OF AEROSPACE ENGINEERING

Subject Code & Name**: 23AST205 AEROSPACE STRUCTURES**

UNIT: **5. STRESS ANALYSIS IN WING AND FUSELAGE**

TOPIC**: 4. Shear force and bending moment distribution over the aircraft wing**



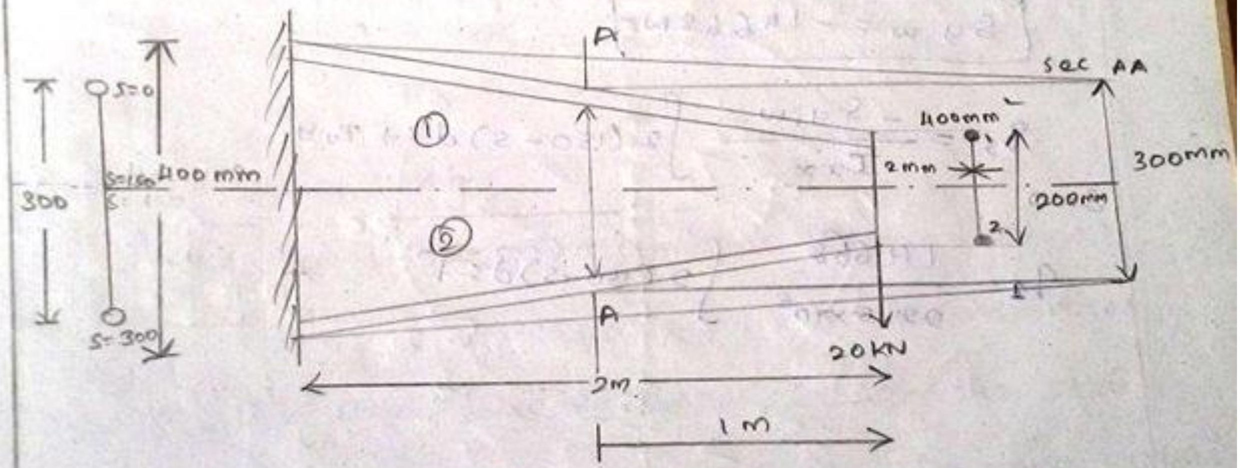
Also,

$\sigma_{z,1} = -\sigma_{z,2}$

Axial load $\Rightarrow P_{z,1} = -P_{z,2}$

component in flanges

1) Determine shearflow distribution in the web of tapered beam shown in fig. At section midway along its length. thickness of web = 2 mm. find out M_x.



Soln:-

Moment at section AA

$$M_x = 20\times10^3 \times 1\times10^3$$

$$= 20\times10^6 \ N.mm$$

$$I_{xx} = \Sigma I_{cx} + \Sigma Ay^2 + \Sigma A y_0^2$$

$$= \frac{2\times300^3}{12} + \left(400\times150^2 + 400\times(-150)^2\right)$$

$$= 22.5\times10^6 \ mm^4$$

$$F_B = \frac{Wz}{d} - \frac{W}{2\tan\alpha}$$

$F_T \rightarrow$ force in top flange
$F_B \rightarrow$ force in bottom flange

③ Compressive load in vertical stiffner

$$P = \frac{Wb}{d} \tan\alpha$$

④ Crippling load

$$P_{cr} = \frac{\pi^2 EI}{l_e^2}$$

$$l_e = \frac{d}{\sqrt{4 - \frac{2b}{d}}}$$

l_e – effective length

⑤ $$\sigma_s = \frac{Wb}{A_s d} \tan\alpha$$

σ_s – stress in stiffner

⑥ $$M_{max} = \frac{Wb^2 \tan\alpha}{12d}$$

$$\sigma_T = \frac{F_T}{A_{ft}} \qquad \sigma_B = \frac{F_B}{A_{fb}}$$

$M_{max} \rightarrow$ max Bending moment

$\sigma_T \rightarrow$ Stress in top flange

$\sigma_B \rightarrow$ Stress in bottom flange

$A_{ft} \rightarrow$ Area of top flange.

) A wing shown in figure is assumed to have complete tension field web. If the cross sectional area of flanges and stiffner are 350 mm² and 300 mm². The elastic sectional modulus of t

$P_{z1} = \sigma_{z1} \times (\text{Boom area})_1 \; ; \; \sigma_{z1} = +133.3$

$P_{z1} = 133.3 \times 400$

$P_{z1} = 53320 \text{ N}$

$$S_{y,w} = S_y - P_{z,1}\frac{\delta y_1}{\delta z} - P_{z,2}\frac{\delta y_2}{\delta z}$$

$$= -20\times10^3 - (P_{z1})\frac{(-100)}{2\times10^3} - (P_{z2})\frac{100}{2\times10^3}$$

$$= -20\times10^3 + 53320\frac{100}{2\times10^3} + 53320\frac{100}{2\times10^3}$$

$$\boxed{S_{y,w} = -14668 \text{ N}}$$

$$q_s = \frac{-S_{y,w}}{I_{xx}}\int 2(150-s)\,ds + B_1 y_1$$

$s=0$

$$q_1 = \frac{14668}{22.5\times10^6}\int 2(150-s)\,ds +$$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CLASS!