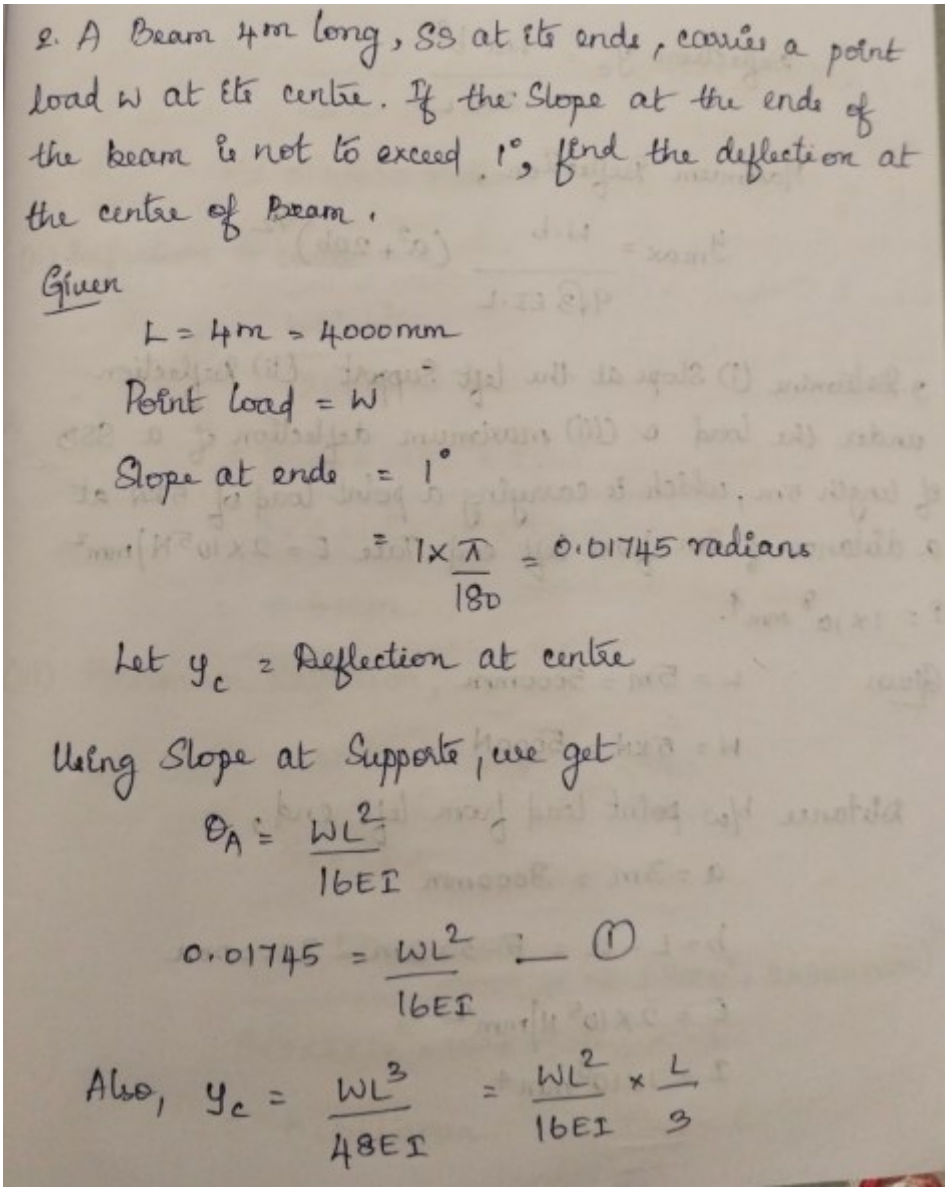
SNS COLLEGE OF TECHNOLOGY

DEPARTMENT OF AGRICULTURAL ENGINEERING

23AGT205-STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING

NOTES UNIT III



2. A Beam 4m long, SS at its ends, carries a point load W at its centre. If the Slope at the ends of the beam is not to exceed 1°, find the deflection at the centre of Beam.

Given

$L = 4m = 4000mm$

Point load $= W$

Slope at ends $= 1^\circ$

$= 1 \times \frac{\pi}{180} = 0.01745$ radians

Let y_c = Deflection at centre

Using Slope at Supports, we get

$$\theta_A = \frac{WL^2}{16EI}$$

$$0.01745 = \frac{WL^2}{16EI} \quad \text{---} (1)$$

Also, $y_c = \frac{WL^3}{48EI} = \frac{WL^2}{16EI} \times \frac{L}{3}$

$= 0.0174^5 \times \frac{4000}{3}$

$= 23.26mm$

SLOPE & DEFLECTION OF SSB @ ECCENTRIC LOAD

Slope, $\theta_A = \theta_B = -\frac{W.a.b}{6EI.L}(a+2b)$

Deflection $y_c = \frac{Wa^2b^2}{3EIL}$

Maximum Deflection,

$y_{max} = \frac{W.b}{9\sqrt{3}EI.L}(a^2+2ab)^{3/2}$

9. Determine (i) Slope at the left Support (ii) Deflection under the load & (iii) maximum deflection of a SSB of length 5m, which is carrying a point load of 5KN at a distance of 3m from left end. Take $E = 2\times10^5 N/mm^2$ $I = 1\times10^8 mm^4$.

Given $L = 5m = 5000mm$

$W = 5KN = 5000N$

Distance b/w point load from left end,

$a = 3m = 3000mm$

$b = L - a = 5-3 = 2m = 2000mm$

$E = 2\times10^5 N/mm^2$

$I = 1\times10^8 mm^4$

Soln Let θ_A = Slope @ Left Support

y_c = Deflection under load

y_{max} = Max. Deflection

(i) Slope at left Support

$$\theta_A = -\frac{W.a.b}{6EI.L}(a+2b)$$

$$= -\frac{5000 \times 3000 \times 2000}{6 \times 2 \times 10^5 \times 10^8 \times 5000}(3000 + 2 \times 2000)$$

$$= -0.00035 \text{ radians}$$

(ii) Deflection @ centre

$$y_c = \frac{Wa^2.b^2}{3EIL}$$

$$= \frac{5000 \times 3000^2 \times 2000^2}{3 \times 2 \times 10^5 \times 10^8 \times 5000}$$

$$= 0.6 \text{mm}$$

(iii) Maximum Deflection,

$$y_{max} = \frac{W.b}{9\sqrt{3}EI.L}(a^2 + 2ab)^{3/2}$$

$$= \frac{5000 \times 2000}{9\sqrt{3} \times 2 \times 10^5 \times 10^8 \times 5000}(3000^2 + 2 \times 3000 \times 2000)^{3/2}$$

$$= 0.6173 \text{mm}$$