

①

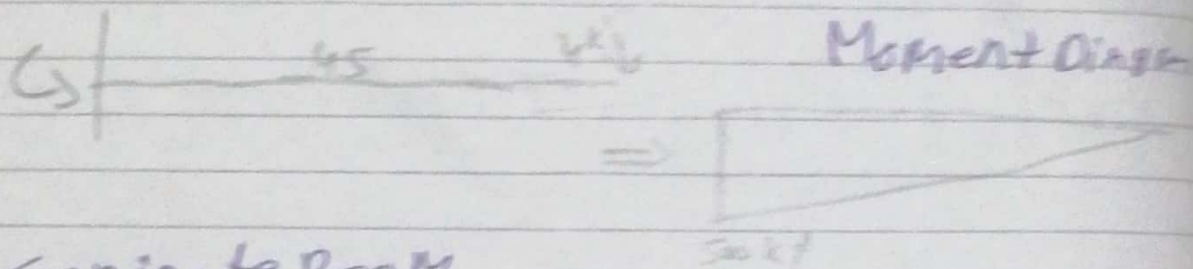
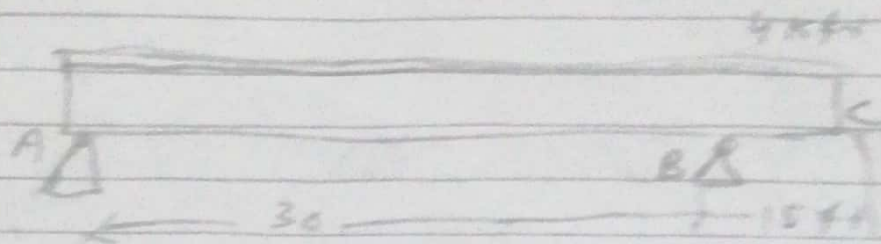
ID 7274

Name Asfand Yar ANway

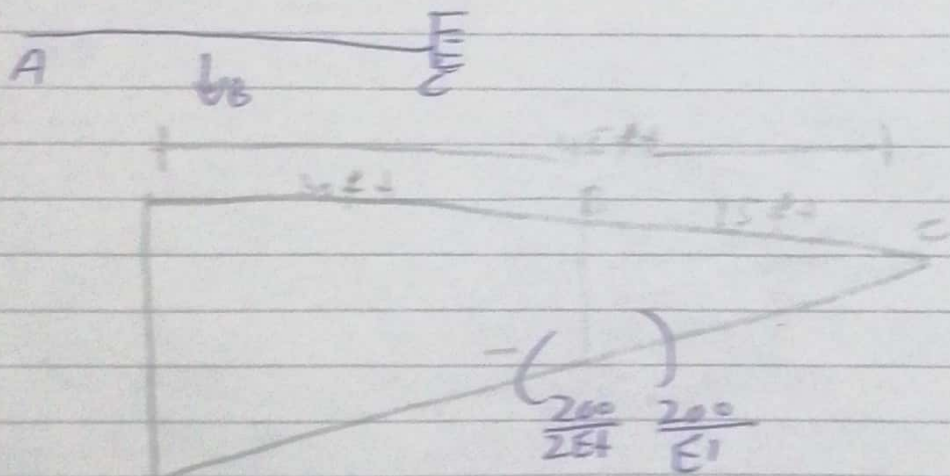
Assignment No 3

Conjugate Beam Method.

Q1

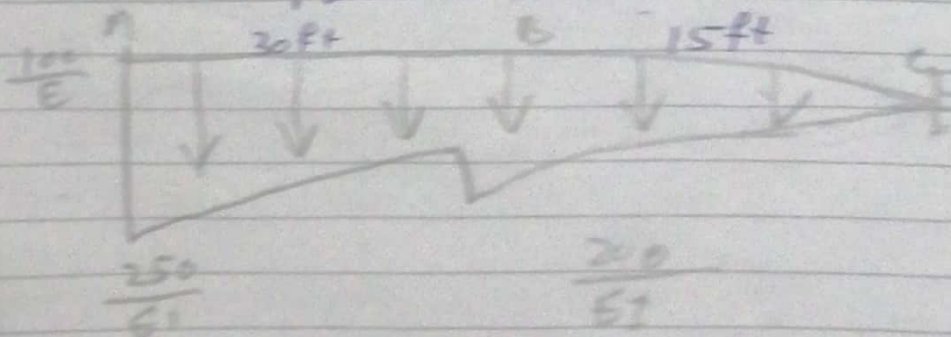


Conjugate Beam



$$\frac{500}{2EI}$$

Shear = slope
Moment = deflection

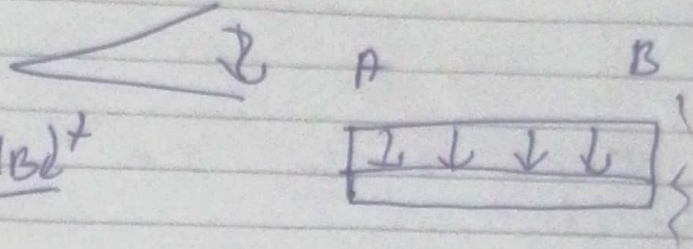


$$\text{Shear at B} = S_B = \frac{1}{EI} \left(-(100)(30) - \frac{150(45)}{2} \right)$$

3

$$S_B = \frac{-2625 \text{ k}\cdot\text{ft}^2}{EI} = \Delta_B = \frac{-2625}{(24000)(3000)}$$

$$\Delta_B = 0.0043$$



Moment at B M_B^+

$$M_B^+ = \frac{1}{EI} \left[-100(30)(17.5) - \frac{150(30)}{2} \left(\frac{2}{3} \right) (15) \right]$$

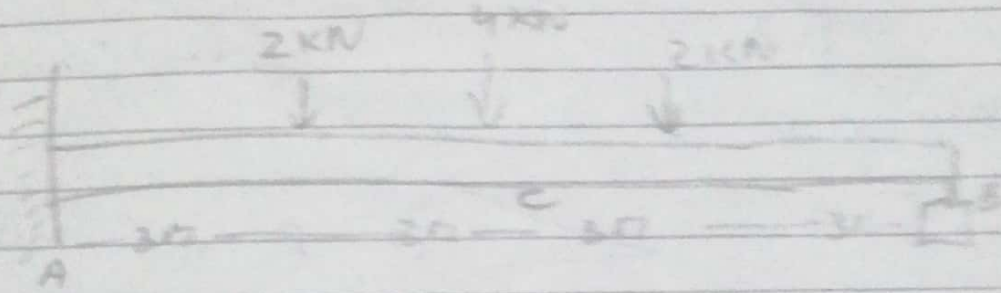
$$M_B^+ = \frac{-22,500 \text{ k}\cdot\text{F}}{EI} = \Delta = \frac{-22500}{(24000)(3000)}$$

$$\Delta_B = 0.45 \text{ in } \downarrow$$

6

Q2

No



$x=0 \quad x=2 \quad x=4 \quad x=6$

(1) Reaction

$\sum MA = 0$ (+ve)

$2 \times 3 \quad 4 \times 6 \quad 2 \times 9 \quad V_B \times 6 = 0$

$V_B = 11.67 \text{ kN}$

$\sum F_y = 0$ (+ve)

$V_A - 2 - 4 - 2 + 11.67 = 0$

$V_A = 13.33 \text{ kN}$

[Clockwise +ve] [Counter-clockwise -ve]

B.M $= EI \frac{d^2y}{dx^2} = 13.33x - 2(x-2) - 4(x-4) - 2(x-6)$

Integrating w.r.t x

$EI \frac{dy}{dx} = 13.33 \frac{x^2}{2} - 2 \frac{(x-2)^2}{2} - 4 \frac{(x-4)^2}{2} + C_1$

⑤

$$EIy = 13.33 \cdot \frac{x^3}{6} - 2 \frac{(x-2)^3}{6} - 4 \frac{(x-4)^3}{6} + c_1 x + c_2 \quad \text{--- (2)}$$

At $x = 0$; $y = 0$ Put in eq (3)

$$0 = 0 - 0 - 0 + 0 + c_2$$

$$\boxed{c_2 = 0}$$

Now $x = 6$; $y = 0$ Put in eq (3)

$$0 = 13.33 \times \frac{(6)^3}{6} - 2 \frac{(6-2)^3}{6} - \frac{4(6-4)^3}{6} + c_1(6) + 0$$

$$c_1 = -51.09$$

Put value of c_1 & c_2 in eq (2) & (3)

$$\frac{EI dy}{dx} = 13.33 \frac{x^2}{2} - 2 \frac{(x-2)^2}{2} - 4 \frac{(x-4)^2}{2} + (-51.09)$$

$$\text{--- (A) [G.I.E]}$$

$$EIy = 13.33 \frac{x^3}{6} - 2 \frac{(x-2)^3}{6} - 4 \frac{(x-4)^3}{6} + (-51.09) + 0 \quad \text{--- B}$$

(G.I.D.E)

6

Put $x=0$ in eq (A) $\theta_A = \frac{dy}{dx}$

$$EI \frac{dy}{dx} \Big|_A = EI \theta_A = 0 - 0 - 0 - 51.09$$

$$\theta_A = \frac{-51.09}{EI} \text{ radians}$$

~~Put in eq~~

Put $x=2$ in eq (B)

$$EI y_c = 13.33 \times \frac{2^3}{6} - 0 - 0 - 51.09 \times 2$$

$$y_c = \frac{-84.4}{EI} \text{ mm (down)}$$