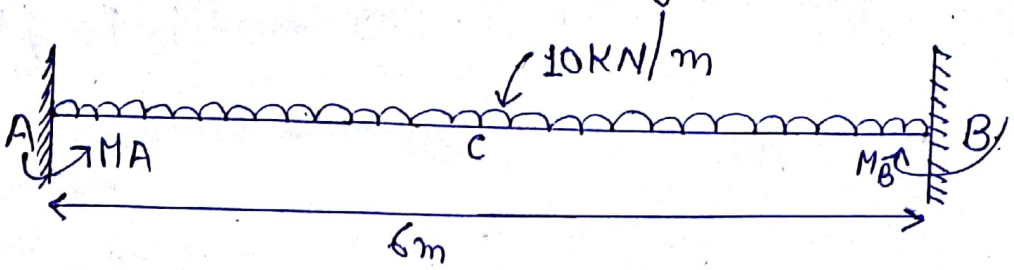
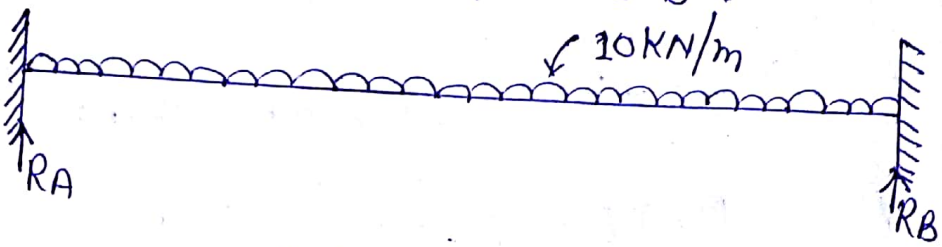
IInd class Test Class = IIIrd Year. Subject = CE-301

Queⁿ ⇒ 1 Draw S.f.D. and B.M.D. for given beam :-



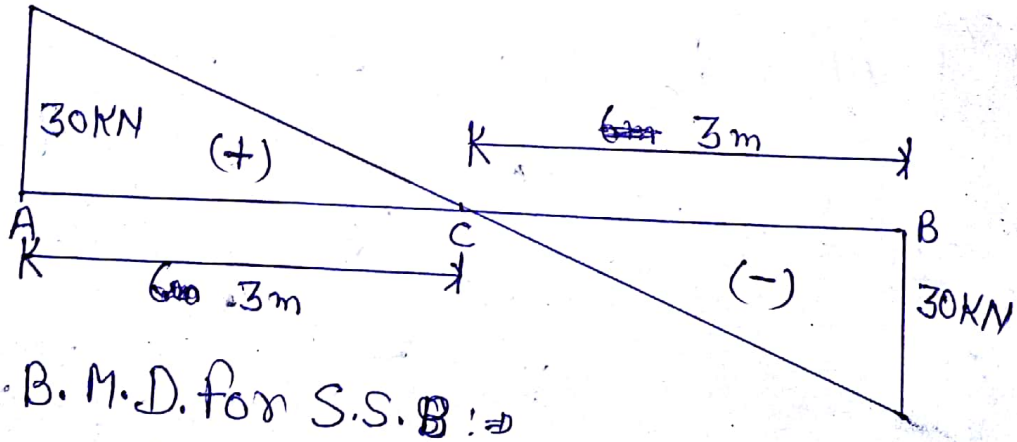
Solⁿ :⇒

fixed beam Converted in S.S.B. :-



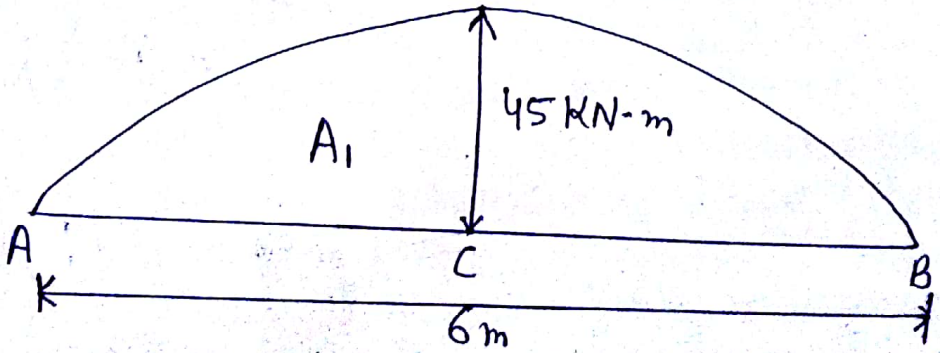
$$R_A = R_B = \frac{Wl}{2} = \frac{10 \times 6}{2} = \frac{60}{2} = 30\,KN$$

- S.f.D. for given beam :⇒



- B.M.D. for S.S.B :⇒

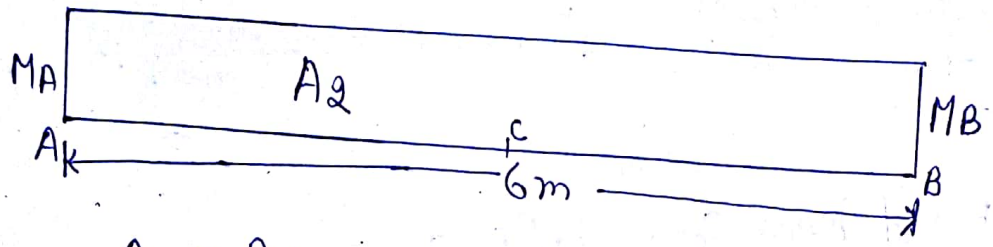
BM at Point C, $BM_C \Rightarrow \frac{Wl^2}{8} = \frac{10 \times 6^2}{8} = 45\,KN\text{-}m$



[P.T.O.]

→ Converted in Fixed or B.M.D. for fixed beam :⇒

Assume $M_A = M_B$ (∵ Symmetric load)



$A_1 = A_2$

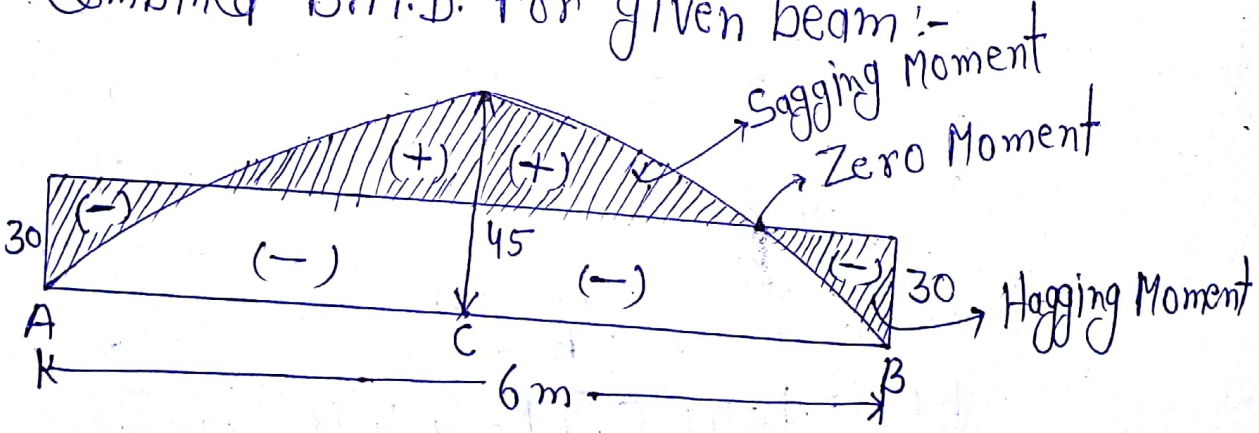
$A_1 = \frac{2}{3} \times L \times \frac{wl^2}{8} = \frac{2}{3} \times 6 \times 45 \Rightarrow \underline{180\ m^2}$

$A_2 = M_A \times L = M_A \times 6$

$M_A \times 6 = 180$

$M_A = \underline{30\ KN\text{-}m} = M_B$

→ Combined B.M.D. for given beam :-

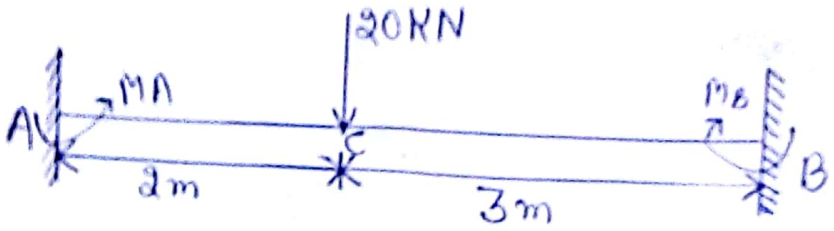


Sagging Moment or Net Moment = 45-30

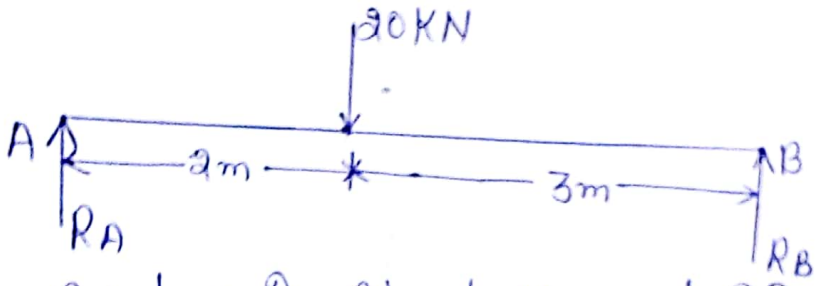
= 15 KN-m

[P.T.O.]

Que:- 2. Draw SFD. and B.M.D. for given beam:-



Soln:- ⇒ Convert in S.S. Beam :⇒



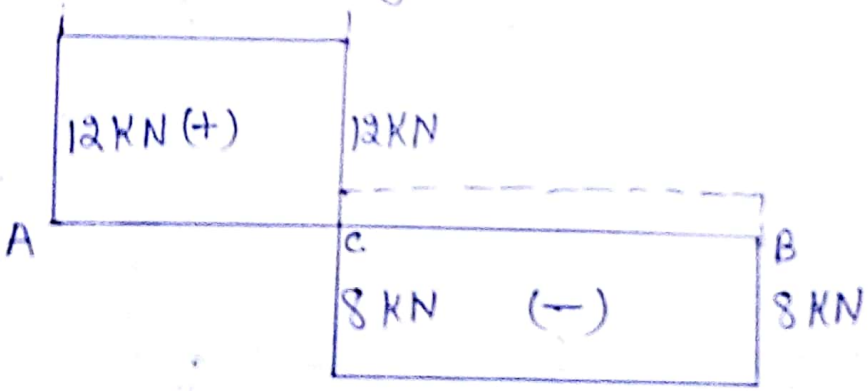
Point A पे About Moment लेने पर :-

$R_B \times 5 - 20 \times 2 = 0$

$R_B = \underline{8\ KN}$

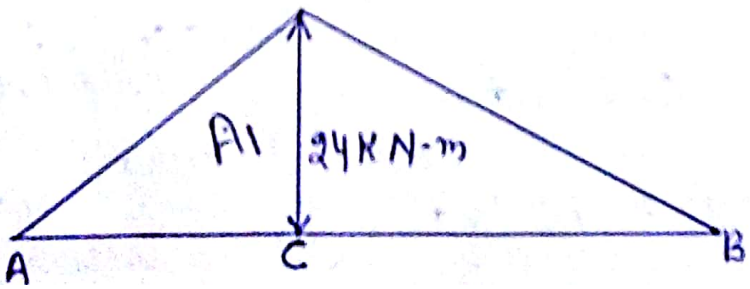
$R_A = \underline{12\ KN}$

→ S.F.D. for given beam ⇒



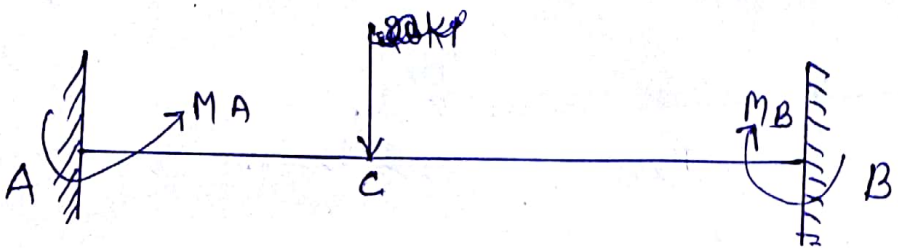
→ B.M.D. for S.S.B :-

Point C पर $BM_C \Rightarrow \frac{Wab}{L} = \frac{20 \times 2 \times 3}{5} \Rightarrow \underline{24\ KN\text{-}m}$

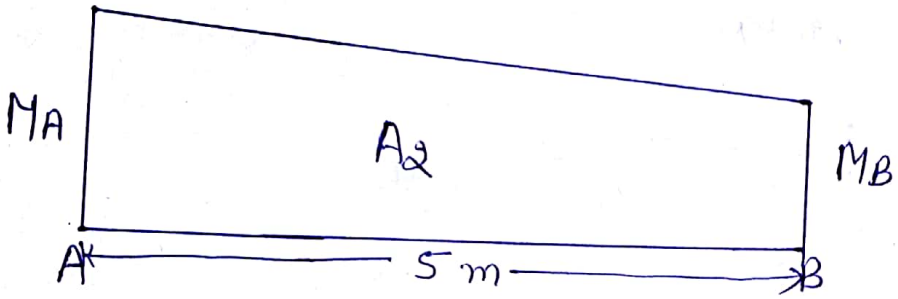


[P.T.O.]

→ B.M.D. for fixed Beam :⇒



Assume $M_A > M_B$



$A_1 = A_2$

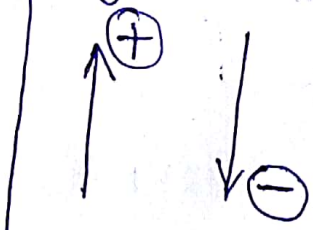
$A_1 = \frac{1}{2} \times 5 \times 24 \Rightarrow 60$

$A_2 = \left(\frac{M_A + M_B}{2}\right) \times 5$

$60 = \left(\frac{M_A + M_B}{2}\right) \times 5$

$M_A + M_B = 24$ —— (1)

Sign Convention :-



$A_1 X_1 = A_2 X_2$

$60 \times \left[\frac{a+2b}{L}\right] = \left[\left(\frac{M_A+M_B}{2}\right)\times 5\right] \times \left[\frac{2M_B+M_A}{M_A+M_B} \times \frac{L}{3}\right]$

$60 \times \left[\frac{2+3\times 2}{5}\right] = \frac{5}{2}\ \cancel{(M_A+M_B)} \times \frac{(2M_B+M_A)}{\cancel{(M_A+M_B)}} \times \frac{5}{3}$

$60 \times 1.6 = 2.5 \times (2M_B + M_A) \times 1.66$

$2M_B + M_A = 23.13$ —— (2)

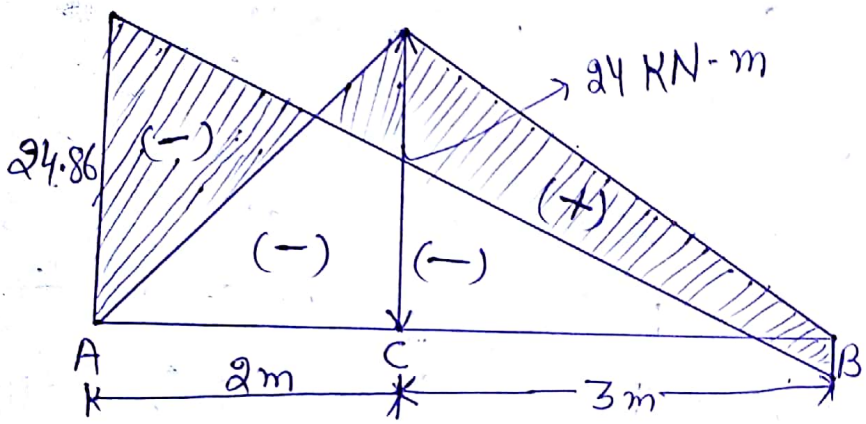
[P.T.O.]

Eq-① व Eq-② को घटाने पर :-

$$M_A + M_B = 24$$
$$\underline{M_A + 2M_B = 23.13}$$
$$-M_B = .86$$
$$M_B = -.86$$

$$M_A = 24.86 \text{ KN-m}$$

→ Combined S.F.D. and B.M.D :⇒



→ Reaction Reduction :⇒ $\frac{M_A - M_B}{2} = \frac{24.86 - .86}{2} = 12$

$R_A = 12 + R = 12 + 12 = 24$ KN

$R_B = 12 \cdot 8 - 12 = -4$ KN

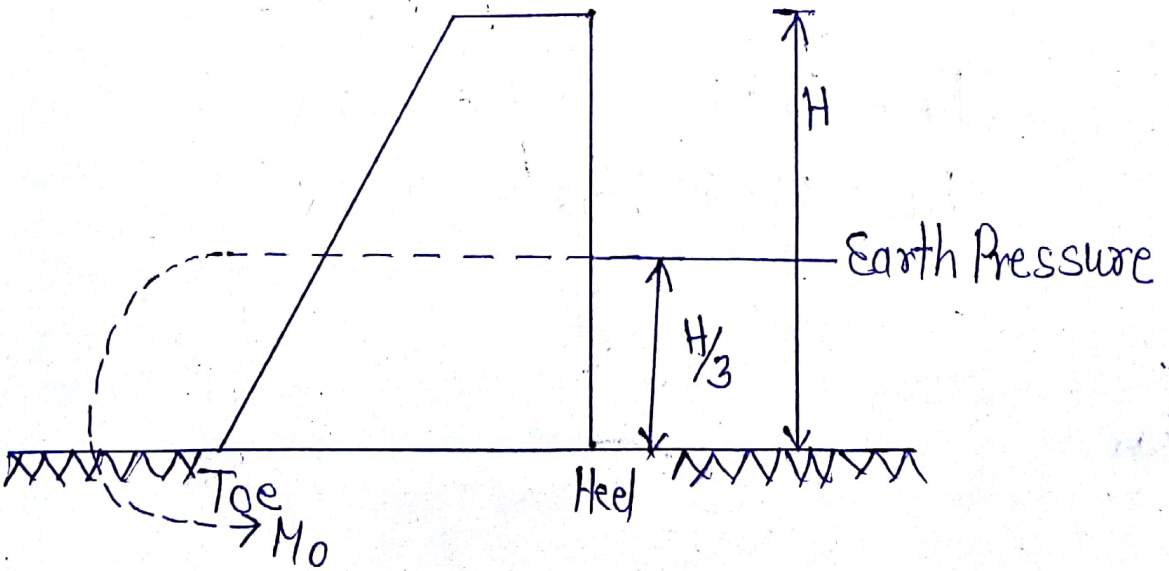
[P.T.O.]

Que:3 ⇒ Write the Condition for Stability of Retaining Wall and Write the Advantage of fixed beam?

Ans → Stability of Reataining Wall :⇒ Reataining wall तीन कारणों से fail होती है जिसके Against हमें Stability Provide करनी होती है। जो निम्न है:-

(1) Overturning.
(2) Sliding.
(3) failure of Sub-Soil under Soil.

(1) Overturning :⇒ → Wall पर Overturning Moment होता है वह Earth के Pressure के कारण होता है। जो Reataining Wall को Toe के About Overturn कर देता है।

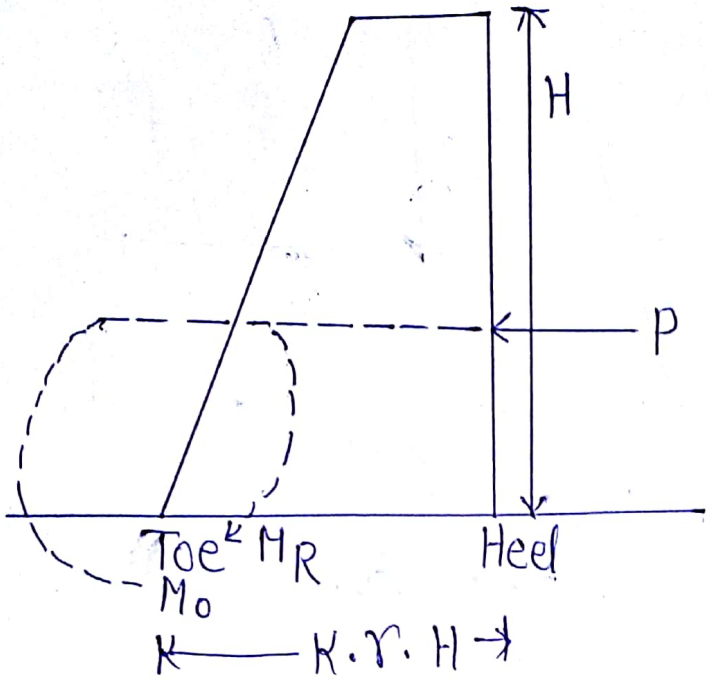


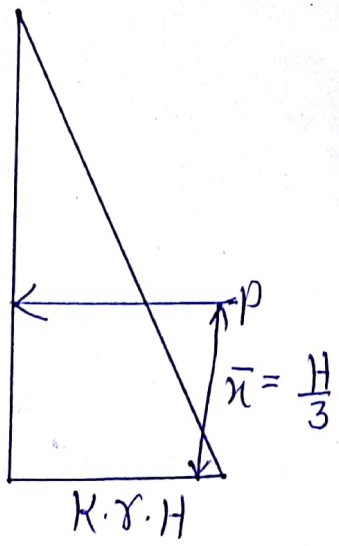
Mo = Pressure force x Perpendicular distance (1)

$$M_o = \frac{1}{2} \times K \times \gamma \times H \times \frac{H}{3}$$

[P.T.O.]

$$M_o = \frac{K \times \gamma \times H^2}{6}$$





(Pressure diagram)

$$M_R = \Sigma w t \times \bar{x}$$

$M_o < M_R$ होना चाहिए।

$$f.O.S. = \frac{M_R}{M_o} > 1.0$$

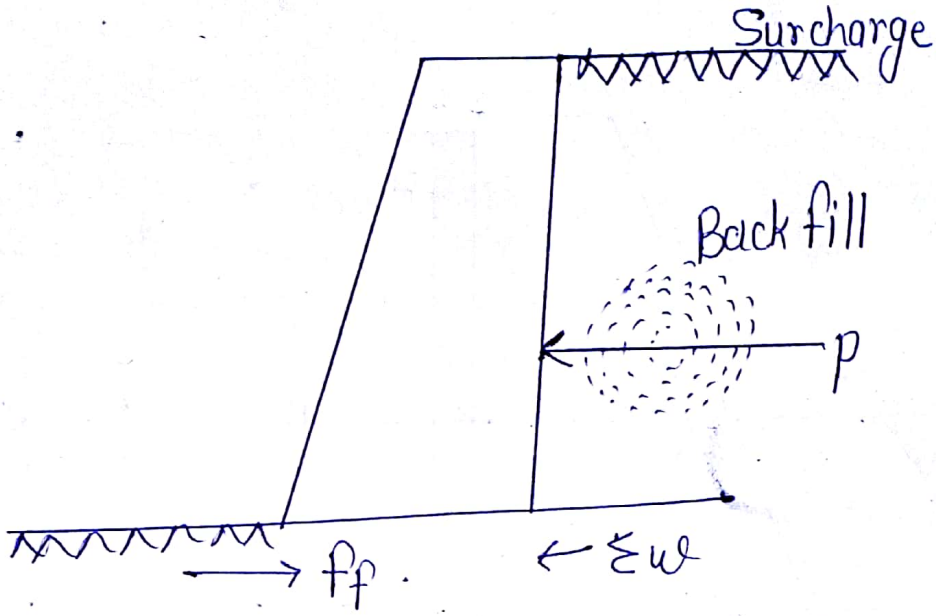
$$f.O.S._{(Design)} = 1.5$$

(2) Sliding failure :⇒

→ Wall पर लग रहा Lateral Earth Pressure Wall को Slide करने की कोशिश करता है और Wall को Backfill से दूर करने की कोशिश करता है। यह Sliding, Soil और Base के बीच friction के द्वारा Resist की जाती है।

friction force $f_f = \mu \Sigma w = M_R$ [P.T.O.]

μ = friction Cofficient b/w Concrete and Soil.



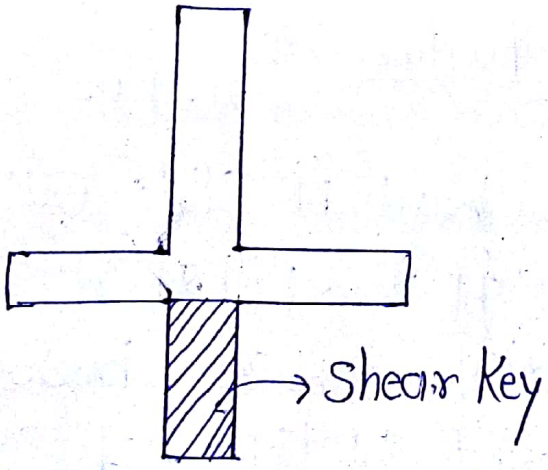
$$M_S = \frac{1}{2} \times K_a \times \gamma \times H \times \frac{H}{3} H$$

$$M_S = \frac{K_a \gamma H^2}{2}$$

$$K_a = \frac{1 - \sin\phi}{1 + \sin\phi}$$

$$\boxed{M_R > M_S}$$

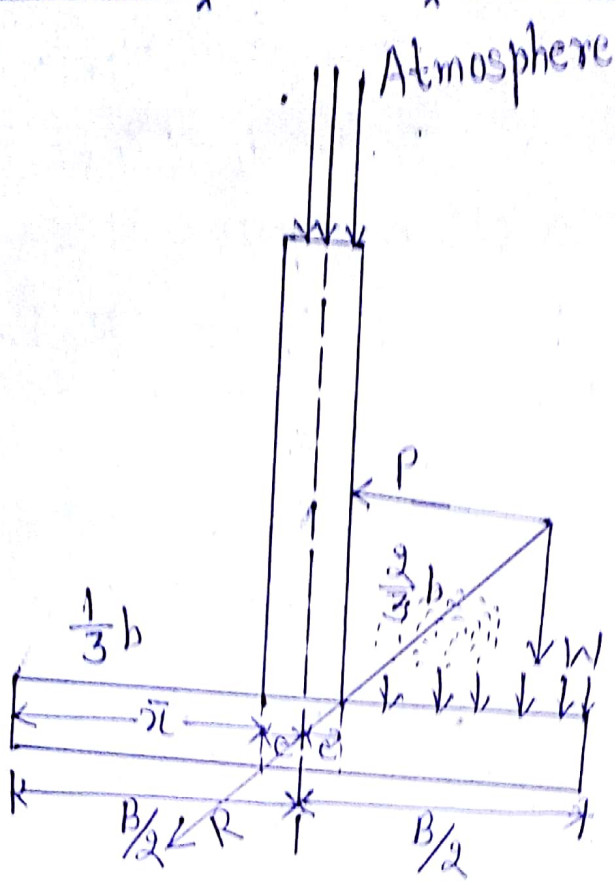
→ कभी-2 Sliding or shear failure को रोकने के लिए Shear Key Provide की जाती है।



→ Shear Key Additional Moment Resistance Provide करती है।

[P.T.O.]

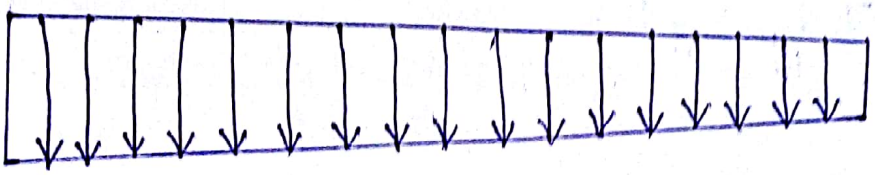
(3) Failure of Sub-Soil under Soil :-



→ Retaining Wall की base width इस तरह design की जानी चाहिए कि उसके ऊपर आने वाला load उस पर tension develop ना करें। Lateral Earth Pressure P और load W दोनों का Resultant Middle third Zone में होना चाहिए।

$$e = \frac{B}{2} - \bar{x}$$

$$e \not> \frac{B}{6}$$



(Pressure or shear distribution diagram)

[P.T.O.]

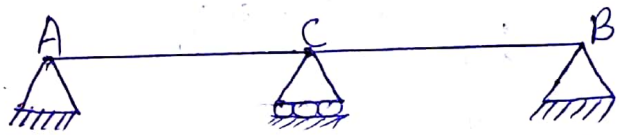
* Advantages of fixed beam :⇒

→ fixed beam बड़ा strong and stable होती है।

→ Ends पर Slope and Deflection Zero होता है।

→ Beam के दोनों ends पर Moment develop होता है जिसके कारण Beam के Centre पर Deflection कम हो जाता है।

Que:4⇒ Find the total Indeterminacy of given fig. :-



Soln:⇒

→ External Indeterminacy :⇒

$E = R - r$

$E = 5 - 3 = 2°$

→ Internal Indeterminacy :⇒

$I = R' - r'$

$I = 3 - 2 = 1°$

→ Total Indeterminacy :⇒

$T = 2 + 1 = 3°$

[End]