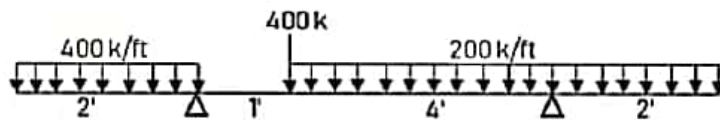
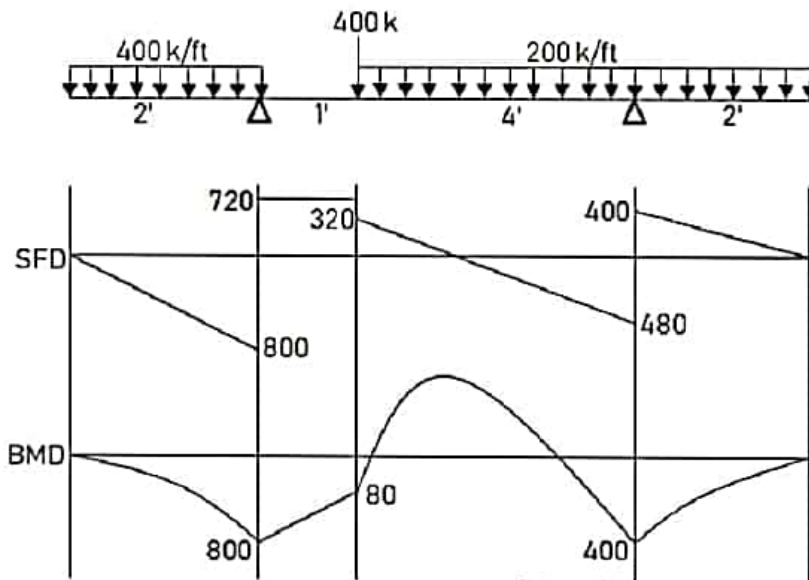


AGRANI BANK – 2017
Post: Senior Officer (Civil)

1. Draw SFD and BMD of the following figure



Solution



2. Define unit hydrograph, Newtonian fluid and suppressed weir.

Solution:

Unit hydrograph: A unit hydrograph is defined as the hydrograph of direct runoff resulting from one unit depth (1 cm) of rainfall excess occurring uniformly over the basin and at a uniform rate for a specified duration (D hours).

Newtonian Fluid: A real fluid, in which the shear stress is directly, proportional to the rate of shear strain (or velocity gradient), is known as a Newtonian fluid.

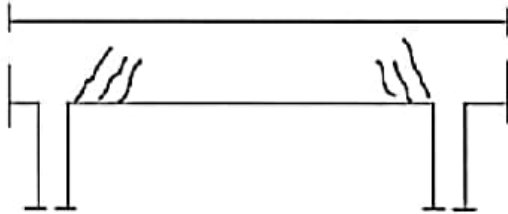
Suppressed weir: A rectangular weir that has only the crest far removed from the channel bottom, the sides are coincident with the sides of the approach channel, so no lateral contraction of water passing through the weir is possible.

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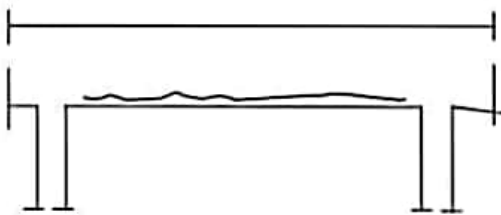
3. Draw the different type's cracks in a beam. Difference between normal stress, shear stress and flexural stress.

Solution:

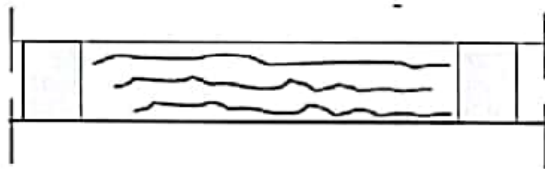
1. Cracks in concrete beams due to increased shear stress



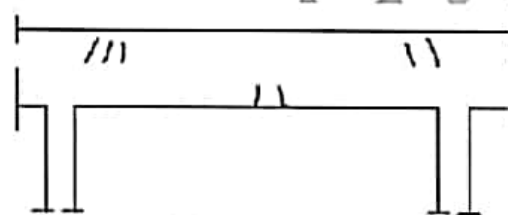
2. Cracks in concrete beams due to corrosion or insufficient concrete cover



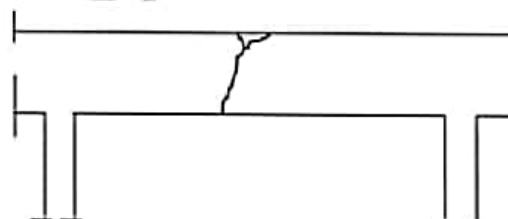
3. Cracks parallel to main steel in case of corrosion in beams due to moisture infiltration at the joint



4. Cracks due to increased bending stress in beams



5. Cracks due to compression failure in beams



Normal Stress: A normal stress is a stress that occurs when a member is loaded by an axial force. A normal stress will occur when a member is placed in tension or compression.

$$\sigma = \frac{P}{A}$$

Flexural stress: When a member is being loaded similar to that in figure one bending stress (or flexure stress) will result. Stress produced by the bending force in the body is what we call flexural stress. Bending stress is maximum at top or bottom most fibre and it is zero at neutral axis.

$$\text{Flexural stress, } \sigma = \frac{M Y}{I}$$

Shear stress: Normal stress is a result of load applied perpendicular to a member. Shear stress however results when a load is applied parallel to an area.

$$\text{Shear stress, } \tau = \frac{V Q}{I b}$$

4. A road is measured by a 20 m chain is found to be 500 m. It was found later that the chain is 4 cm too long. What is the actual length?

Solution:

$$\begin{aligned} \text{We know, } l &= l' \times \frac{L'}{L} \\ &= 500 \times \frac{20 + 0.04}{20} \\ &= 501 \text{ (Ans.)} \end{aligned}$$

5. Determine active and passive pressure diagram of a 3 m deep retaining wall where $\gamma = 20 \text{ KN/m}^3$ and $\phi = 35^\circ$

Solution:

$$K_a = \frac{1 - \sin\phi}{1 + \sin\phi} = \frac{1 - \sin 35}{1 + \sin 35} = 0.27$$

$$K_p = \frac{1 + \sin\phi}{1 - \sin\phi} = \frac{1 + \sin 35}{1 - \sin 35} = 3.65$$

$$\text{Active pressure} = K_a \gamma Z = 0.27 \times 20 \times 3 = 16.2 \text{ KN/m}^2$$

$$\text{Passive pressure} = K_p \gamma Z = 3.65 \times 20 \times 3 = 219 \text{ KN/m}^2$$

DESIGN INTEGRITY

Design Integrity

15 OCT 2020



Like



Comment



6. A reinforced concrete column of effective length 7 m and column diameter is 300 mm with 8 - 16 mm rebar. Concrete mix used is M15 and $f_y = 415 \text{ Mpa}$. Using working stress design (WSD) method to determine the column strength.

Solution:

$$A_g = \pi r^2 = \pi \times 150^2 = 70686 \text{ mm}^2$$

$$A_s = 8 \times 201.06 = 1608.5 \text{ mm}^2$$

$$f_c' = 15 \text{ MPa} = 15 \text{ N/mm}^2$$

$$f_y = 415 \text{ MPa} = 415 \text{ N/mm}^2$$

$$f_s = 0.4 f_y = 0.4 \times 415 = 166 \text{ N/mm}^2$$

$$L/b = 7 \times 1000 / 300 = 23.33 > 12$$

so it's a long column, Reduction factor will be used

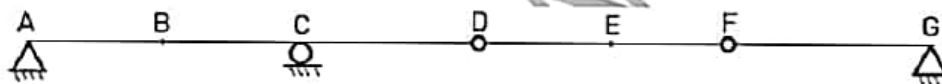
$$Cr = 1.25 - \frac{le}{48 b} = 1.25 - \frac{7 \times 1000}{48 \times 300} = 0.76$$

$$P = Cr \cdot 0.85 [0.25 f_c' A_g + f_s A_s]$$

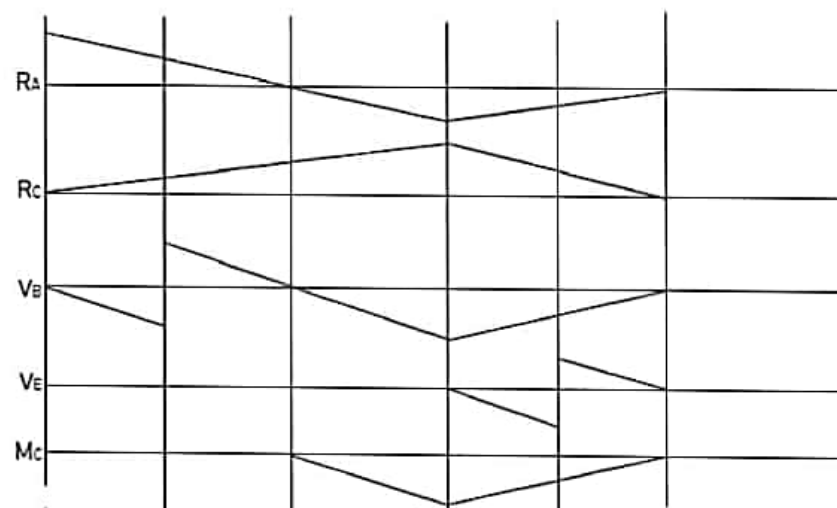
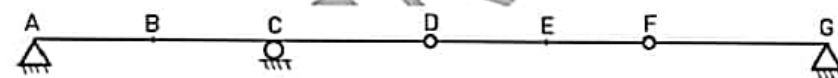
$$= 0.76 \times 0.85 [0.25 \times 15 \times 70686 + 166 \times 1608.5]$$

$$= 343725.94 \text{ N} = 343.725 \text{ KN}$$

7. Draw influence line diagram for R_A , R_C , V_B , V_E and M_C .



Solution:



DESIGN INTEGRITY

8. A trapezoidal channel of 8 m width discharge water 56 m³/s. Find out the depth of the channel if the side slope of the channel is 1:1.5. Consider bed slope 0.019 and manning coefficient 0.017.

Solution:

$$\text{Area, } A = (b + s h) h$$

$$\text{Perimeter, } P = b + 2 s h$$

$$\text{Hydraulic mean depth, } R = \frac{A}{P} = \frac{(b + s h)h}{b + 2 s h}$$

$$\text{We know, } Q = \frac{1}{n} A R^{2/3} S^{1/2}$$

$$\text{Or, } Q = \frac{1}{n} \left[\frac{(b + s h)h}{b + 2 s h} \right]^{2/3} S^{1/2}$$

$$56 = \frac{1}{0.017} \left[\frac{(8 + 1.5 h)h}{8 + 3 h} \right]^{2/3} 0.019^{1/2}$$

$$\frac{(8 + 1.5 h)h}{8 + 3 h} = 6.87$$

$$h = 11.573 \text{ m}$$

9. Write an essay on "The role of green banking for sustainable growth in Bangladesh"

10. রচনা লিখুন "বাংলাদেশের ব্যাবসায় বৈদেশিক ব্যাংকের ভূমিকা"