Recitation 004

09/27/2024

GSI Info

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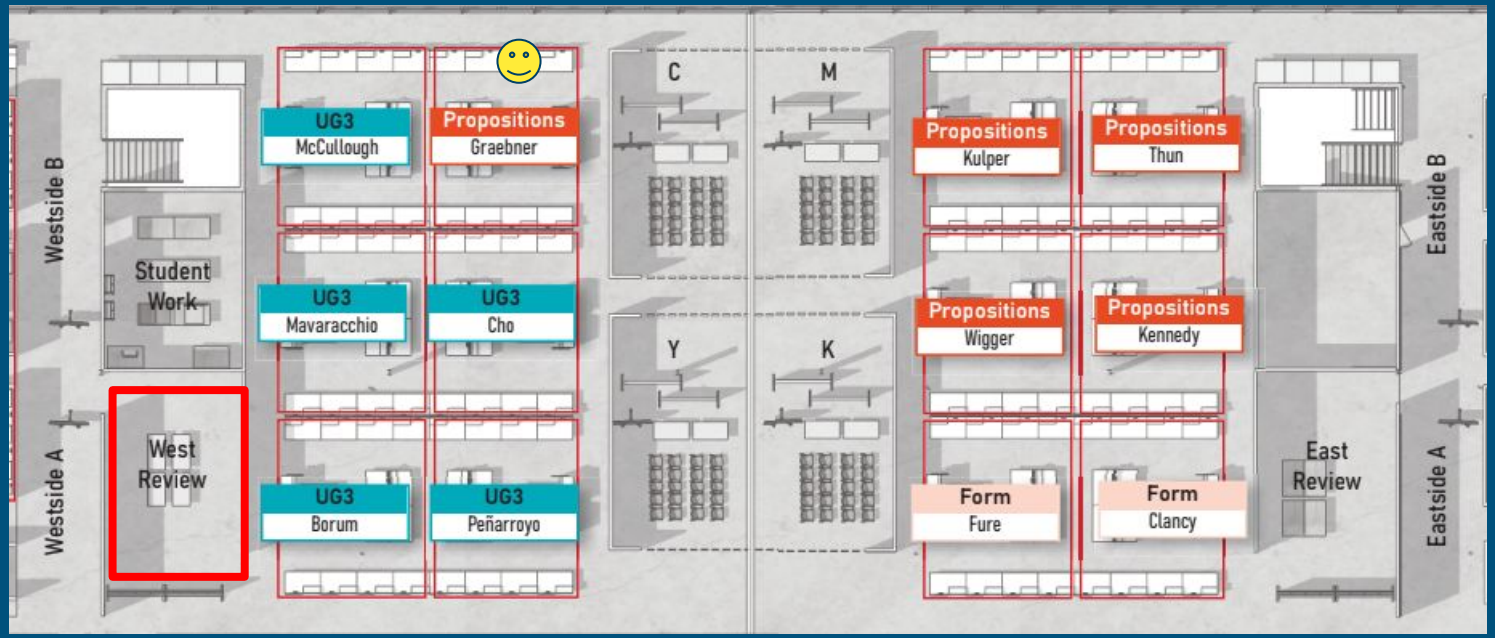


Questions

THE Bridge

- Due Dates:
  - Prelim. Report - 10/04/2024 (Next Friday)
  - Bridge Test Date - 11/04/2024
  - Final Report - 11/25/2024
- Scoring: See the Rubric on the site
  - 40/250 for the Prelim Report
  - 60/250 for Testing
    - How the bridge does, affects points
    - 14 points for following the rules
  - 150/250 Final Report

THE Bridge

- KEY RULES:
  - Must Load on the deck
  - Cannot perforate the deck
  - Wood & Glue only
  - Must be under 4 oz (CHECK IT)
  - Must Span the distance (CHECK IT)
- Some Helpful Tips
  - Expect the Bridge to sink a little under the weight (30” length will immediately fall)
  - Approxim. 10% of weight is glue
  - Do a test bridge
  - Don’t wait until the last minute to build the bridge

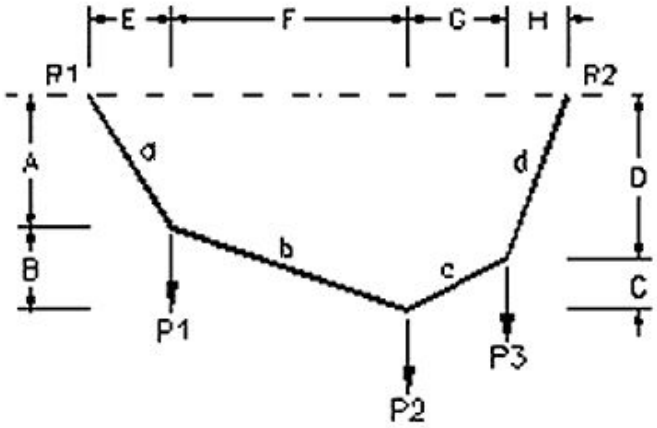
HW #6

6. Cable Systems

For the cable loaded as shown, determine the horizontal and vertical components of each end reaction, and the tensile force in each cable segment.

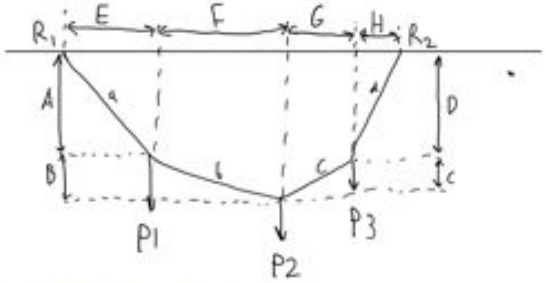
DATASET: 1 -2- -3-

Length E	5 FT
Length F	16 FT
Length G	26 FT
Length H	5 FT
Center height (A + B)	26 FT
Force P1	1 KIPS
Force P2	5 KIPS
Force P3	1 KIPS



#	Question
1	HORIZONTAL component of R1 (+ = to the right)
2	VERTICAL component of R1 (+ = upward)
3	HORIZONTAL component of R2 (+ = to the right)
4	VERTICAL component of R2 (+ = upward)
5	Total Force in member 'a' (+ = tension)
6	Horiz. Force in member 'b' (absolute value)
7	Vertical Force in member 'b' (absolute value)
8	Total Force in member 'b' (+ = tension)
9	Horiz. Force in member 'c' (absolute value)
10	Vertical Force in member 'c' (absolute value)
11	Total Force in member 'c' (+ = tension)
12	Total Force in member 'd' (+ = tension)
13	Height A
14	Height B
15	Height C
16	Height D

Due 9/29/2024



Center (A+B) = 26'

E = 5'
F = 16'
G = 26'
H = 5'

P1 = 1 kip
P2 = 5 kips
P3 = 1 kip

Step 1

Use the moment about R_2 to solve for R_{1y}

$$\Sigma M_{R_2} = 0 = P_3(H) + P_2(G+H) + P_1(F+G+H) - R_{1y}(E+F+G+H)$$

$$0 = 1\,kip(5') + 5\,kip(26'+5') + 1\,kip(16'+26'+5') - R_{1y}(5'+16'+26'+5')$$

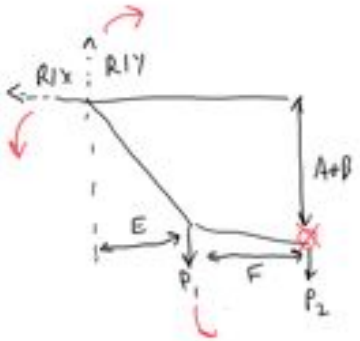
$R_{1y} = 3.9808$ kips

upwards so positive

#2.

Step #2

Use the moment about P2 to solve for R1X



$$\Sigma M_{P_2} = M_{P_1} + M_{R_1y} + M_{R_1x} = 0$$

$$= -F(P1) + R1_y(E+F) - R_{1x}(A+B)$$

$$R1_x = \frac{-F(P1) + R1_y(E+F)}{A+B} =$$

From Step 1 (#2)

$$\frac{-16'(1) + 3.98(5'+16')}{26'} = -2.599 \text{ kips}$$

To the Left

#1

Step #3

Sum horizontal components to determine R2x

$$\Sigma F_x = 0 = R1x + R2x$$

$$R2x = -R1x = 0$$

$$R_2x = 2.5999 \text{ Kips}$$

#3

Step #4

Sum vertical forces to find R2Y

$$\Sigma F_v = R_{1V} - P_1 - P_2 - P_3 + R_{2V} = 0$$

← from Step 1 (#2)

$$0 = 3.98 \text{ kips} - 1 \text{ kip} - 5 \text{ kips} - 1 \text{ kips} + R_2V$$

$$R_2V = +3.0192 \text{ kips}$$

upwards so positive

→ #4

Step #5

Total force in member a

$$\Sigma F_x = a_x - R1_x = 0$$

$$a_x = R1_x$$

$$a_x = -2.5999$$

$$\Sigma F_y = a_y - R1_y = 0$$

$$R1_y = a_y$$

$$a_y = 3.9808$$

$$\sqrt{-2.599^2 + 3.9808^2} = 4.7546 \text{ kips}$$

in tension ⇒ positive

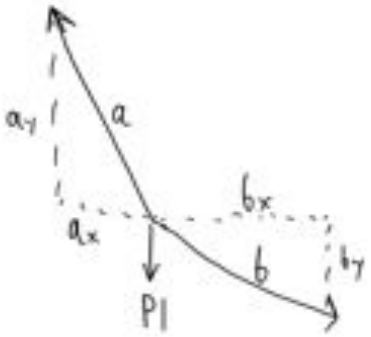
From #1

From # 2

#5

Step #6

Calculate forces in member b



From #R1

$$\Sigma F_x = -a_x + b_x = 0$$

#6 →

$$b_x = 2.5999 \text{ kips}$$

$$\Sigma F_y = a_y - P_1 + b_y = 0$$

From #2 →

$$b_y = 3.9808 - 1$$

$$b_y = 2.9808 \text{ kips}$$

#7 ↑

$$\sqrt{2.5999^2 + 2.9808^2} = +3.9553 \text{ kips}$$

From #6 ↑ From #7 ↑

#8 ↑

+ in tension so positive

Step #7

Calculate forces in member C

$$\Sigma F_x = -b_x + C_x = 0$$

b_x from #6

$$b_x = C_x = 2.5999 \text{ kips}$$

#9

$$\Sigma F_y = b_y + C_y - P_2 = 0$$

$$C_y = 2.9805 \text{ kips} - 5 \text{ kips} = 2.0192 \text{ kips}$$

2.9805 kips: From #7

2.0192 kips: #10

$$\sqrt{2.5999^2 + 2.0192^2} = +3.2919 \text{ kips}$$

2.5999^2: From #9

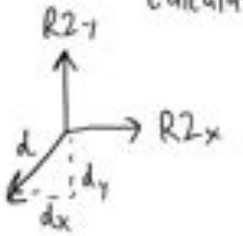
2.0192^2: From #10

#11

+ in tension, positive

Step #8

Calculate force in member d



$$\Sigma F_x = d_x - R2_x = 0$$

$$d_x = R2_x$$

$$d_x = 2.5999 \text{ kips}$$

$$\Sigma F_y = d_y - R2_y = 0$$

$$R2_y = d_y$$

$$d_y = 3.0192 \text{ kips}$$

$$\sqrt{2.5999^2 + 3.0192^2} = + 3.9844$$

+ in tension positive

From #3 — From #4 — #12

Step #9

Calculate heights

Height B

$$\frac{F}{F} : \frac{d}{a} = \frac{b_x}{b_y} : \frac{F}{B} = \frac{2.5999}{2.9808} : \frac{16'}{B}$$

From #6

From #7

$$B = 18.3440'$$

#14

Height A

Center = A + B

#13

$$26' - 18.3440' = 7.6559'$$

From #14

Height C

$$\frac{F}{F} : \frac{d}{d} = \frac{C_V}{C_V} : \frac{G}{C} = \frac{2.5999}{2.0192} : \frac{26'}{G}$$

From #9

From #10

$C = 20.1928'$

#15

Height D

Center = C + D

$26' - 20.1928' = 5.8072'$

From #15

#16.

LAB