Recitation 004

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GSI Info

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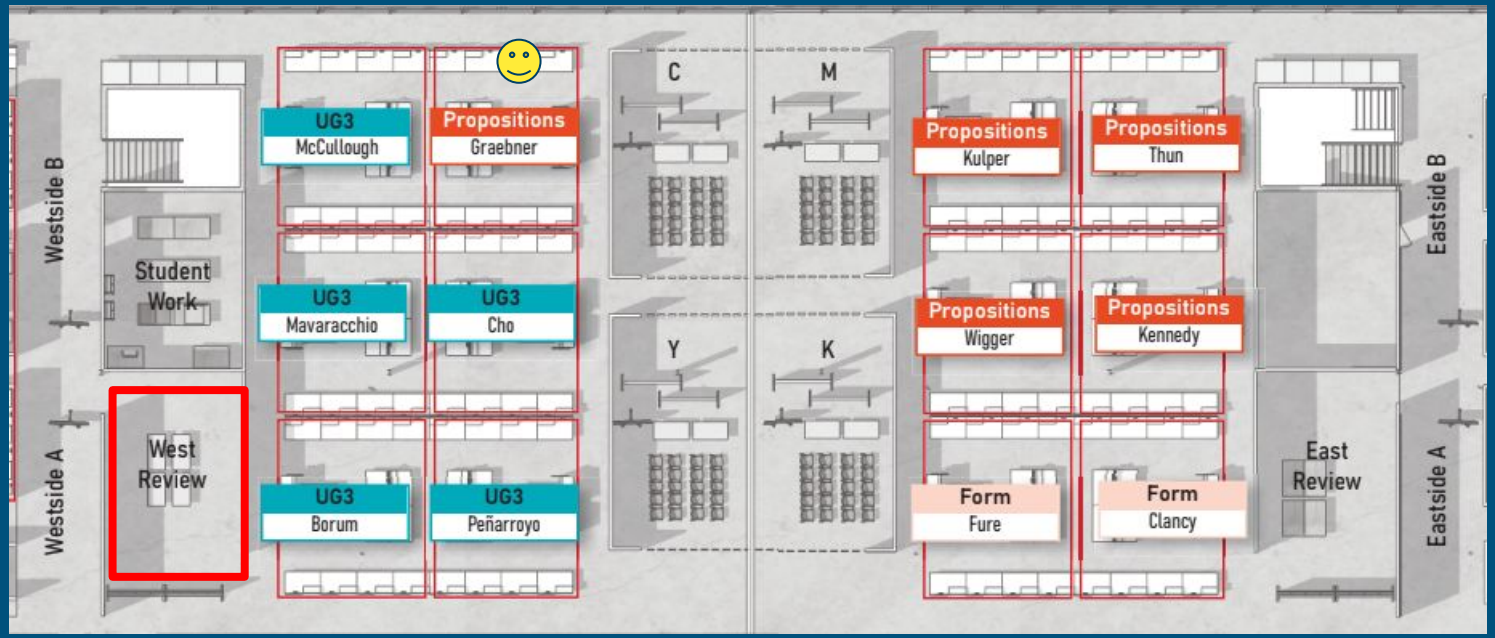
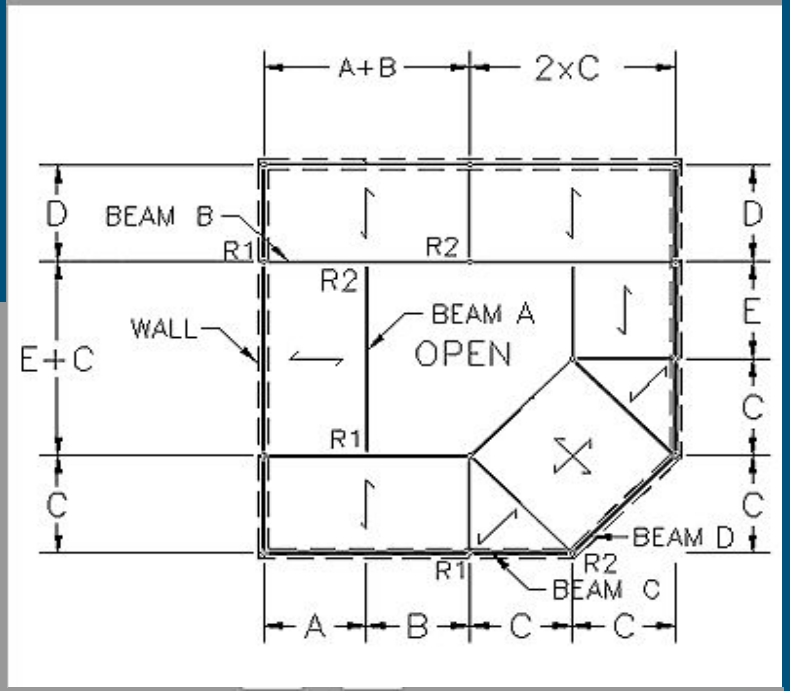


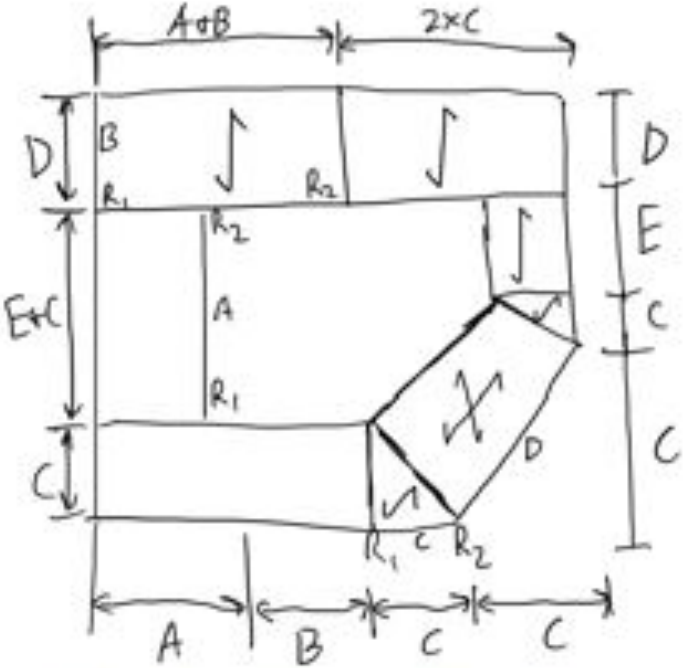
Questions

HW #9

#	Question
1	Full uniform load on Beam A
2	End reaction R1 on Beam A
3	End reaction R2 on Beam A
4	Full uniform load on Beam B
5	Point load on Beam B
6	End reaction R1 on Beam B
7	End reaction R2 on Beam B
8	Full uniform load on Beam C
9	Peak value of triangular load on Beam C
10	End reaction R1 on Beam C
11	End reaction R2 on Beam C
12	Full uniform load on Beam D
13	Peak value of triangular load on Beam D
14	End reaction R1 on Beam D
15	End reaction R2 on Beam D



Span A	9 FT
Span B	11 FT
Span C	10 FT
Span D	14 FT
Span E	9 FT
Dead load of wall	255 PLF
Dead load of floor	21 PSF
Live load on floor	28 PSF



Span A = 9'

Span B = 11'

Span C = 10'

Span D = 14'

Span E = 9'

Dead load of Wall = 255 PLF

Dead load of Floor = 21 PSF

Live Load on Floor = 28 PSF

1. Full uniform load on Beam A

Floor Load = dead load + Live Load

Floor Load = 21 PSF + 28 PSF = 49 PLF

$w = A/2 \times \text{Floor Load} = 9'/2 \times 49\ \text{PLF} = 220.5\ \text{PLF}$

2. End Reactions on Beam A

w = uniform load x (E+C)

w = 220.5 PLF x (9' + 10') = 4189.5 lbs

$\Sigma F_y = R_1 + R_2 - w$

*Reactions are symmetrical

$0 = 2R - 4189.5$

$R = 2094.75$ lbs

↑ #2 and #3

3. Full uniform load on Beam B

= Floor load x D/2 ← only carries ½ of D for Tributary area

= 49 PLF x $\frac{14'}{2}$ = 343 PLF

From #1 ↑

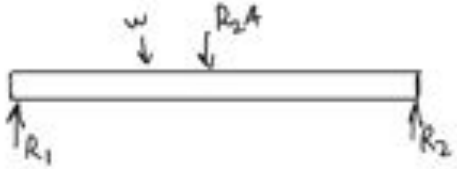
↑ #4

4. Point load on Beam B

Point load = R_2 from Beam A = 2094.75 lbs

From #3 ↑ ↑ #5

5. End Reaction R_2 on Beam B



$w = \text{uniform load} \times (A+B) =$

$w = 343\ \text{plf} \times (9' + 11') = 6860\ \text{lbs}$

From #4

$\Sigma M_{R_1} = R_2A\,(A) + w\left(\frac{A+B}{2}\right) - R_2\,(A+B)$

From #3

$0 = 2094.75(9') + 6860\ \text{lbs}\left(\frac{9'+11'}{2}\right) - R_2(9'+11')$

$R_2 = 4372.6375\ \text{lbs}$

#6

6. End Reaction R1 on Beam B

$$\Sigma F_y = -R_{2A} - W + R_2 + R_1$$

From #3.

$$0 = -2094.75\,lbs - 6860\,lbs + 4372.6375\,lbs + R_1$$

From #7.

$$R_1 = 4582.1125\,lbs$$

#7

7. Full uniform load on Beam C

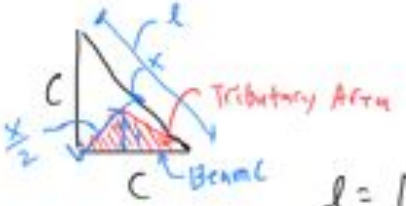
Given

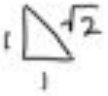
Uniform load on Beam C = wall load = 255 PLF

t#8

8. Peak value of triangular load on C

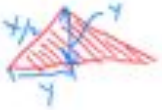
Floor load = 49 PSF
↑ found in #1





$$l = \sqrt{C^2 + C^2} = C\sqrt{2}$$

$$x = l/2 = \frac{C\sqrt{2}}{2}$$



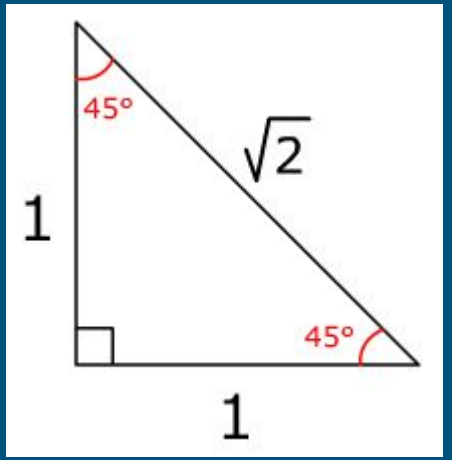
$$\sqrt{y^2 + y^2} = \frac{x}{2} = \frac{C\sqrt{2}}{4}$$

$$\frac{2y^2}{2} = \frac{C^2 \times 2}{16}\left(\frac{1}{2}\right) = \frac{C^2}{16}$$

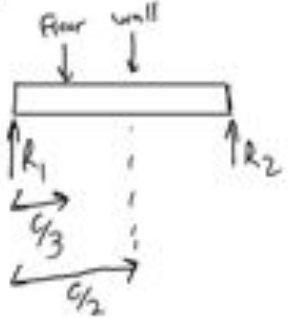
$$y^2 = \frac{C^2}{16} \qquad y = \frac{C}{4}$$

Peak Floor load = floor load × $\frac{C}{4}$ = 49 PLF × $\frac{10'}{4}$ = 122.5 PLF

#9 ↗



9. End Reaction R_2



From #9 ↓ 10'

Floor load = 122.5 PLF × $\frac{C}{2}$ = 612.5 lbs

Wall load = 255 PLF × C = 2550 lbs
↑ 10'

$\Sigma M_{R_1} = 0 = \text{Floor}\left(\frac{C}{3}\right) + \text{Wall}\left(\frac{C}{2}\right) - R_2(C)$

$0 = 612.5\text{lbs}\left(\frac{10'}{3}\right) + 2550\left(\frac{10'}{2}\right) - R_2(10')$

#11 ↓

$R_2 = 1479.1463$

10. End Reaction R_1 on Beam C

$$\Sigma F_y = -\text{Floor}_w - \text{Wall}_w + R_2 + R_1$$

$$0 = -612.5\ \text{lbs} - 2550\ \text{lbs} + 1479\ \text{lbs} + R_1$$

$$R_1 = 1683.3538\ \text{lbs}$$

↑ # 10

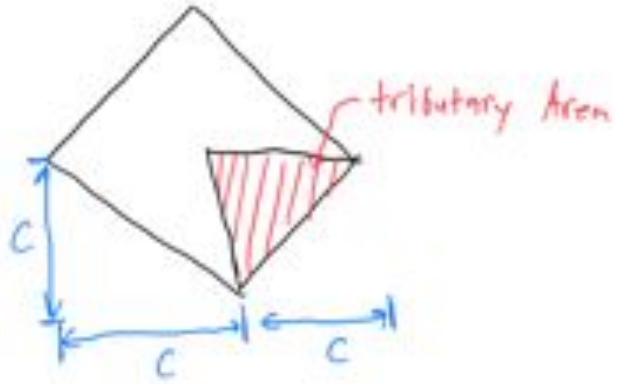
11. Uniform load on Beam D

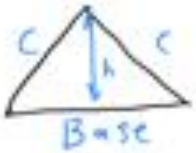
Given

Uniform load on Beam C = wall load = 255 PLF

t# 12

12. Peak value of triangular load





Base $= \sqrt{C^2 + C^2} = C\sqrt{2} = 10'\sqrt{2} = 14.14'$

$h = \frac{1}{2}$ base $= \frac{C\sqrt{2}}{2} = \frac{10'\sqrt{2}}{2} = 7.07'$

Peak value = height x floor load = $7.07'$ x $49\,PLF$ (from #1) $= 346.43$ PLF

#13.

13. End Reactions on Beam D

R_1 & R_2 are symmetrical

$$\sum F_y = 0 = R_1 \& R_2 - W_{wall} - Peak$$

$$W_{wall} = w \times C\sqrt{2} = 255\ PLF \times 10'\sqrt{2} = 3606.24$$

$$Peak\ Floor = 346.48\ PLF \times \frac{C\sqrt{2}}{2} = 2450$$

(From #13; $C\sqrt{2}$ = 10')

$$0 = 2R - 3606.24_{lbs} - 2450\ lb$$

$$R = 3028.12\ lbs$$

LAB