Architecture 324: Structures II

Three Moment Theorem

Problem: Determine Support Moments and Reactions [**ANSWER KEY**]

Given Data:

Span A (L_1)**:** 19 FT	**Span B** (L_2)**:** 28 FT	**Span C** (L_3)**:** 10 FT
Load w_1 **(Span A):** 4 KLF	**Load** P **(Span B):** 66 K	**Dist.** P **from R2** (D)**:** 14 FT
Load w_2 **(Span C):** 5 KLF		

Part 1: Simple End Moments & Load Terms ($EI\theta$)

Q1 Moment at support R1, M1 (- if tension on top)

1. **Final** M_1**:** **0** K-FT

Q2 EI Theta on left side of R2

1. $EI\theta_{2L} = \frac{4(19)^3}{24} =$ **1143.17**

Q3 EI Theta on right side of R2

1. $EI\theta_{2R} = \frac{66(28)^2}{16} =$ **3234.00**

Q4 Moment at support R4, M4 (- if tension on top)

1. **Final** M_4**:** **0** K-FT

Q5 EI Theta on left side of R3

1. $EI\theta_{3L} = \frac{66(28)^2}{16} =$ **3234.00**

Q6 EI Theta on right side of R3

1. $EI\theta_{3R} = \frac{5(10)^3}{24} =$ **208.33**

Part 2: Internal Support Moments

Intermediate Step: Set up 3-Moment Equations

Eq A: **94** M_2+ **28** $M_3 =$ **-26263**

Eq B: **28** M_2+ **76** $M_3 =$ **-20654**

Solve equations simultaneously:

Q7 Moment at support R2, M2 (- if tension on top)

1. **Final** M_2**:** **-222.91** K-FT

Q8 Moment at support R3, M3 (- if tension on top)

1. **Final** M_3**:** **-189.64** K-FT

Part 3: Support Reactions

Q9 Support reaction, R1 (- if downward)

1. $38.00 - 11.73 =$ **26.27** K

Q10 Support reaction, R2 (- if downward)

1. $(38.00 + 11.73) + (33.00 + 1.19) =$ **83.92** K

Q11 Support reaction, R3 (- if downward)

1. $(33.00 - 1.19) + (25.00 + 18.96) =$ **75.78** K

Q12 Support reaction, R4 (- if downward)

1. $25.00 - 18.96 =$ **6.04** K