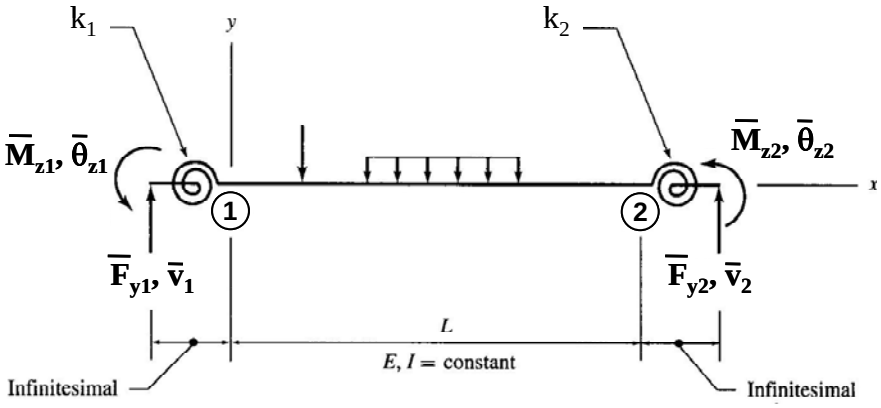
CE483 ADVANCED STRUCTURAL ANALYSIS

FLEXIBLE (SEMI-RIGID) CONNECTIONS



Modified element force-displacement relationship in local coordinates is $\underline{\overline{P}} = \underline{\overline{K}}\,\underline{\overline{D}} + \underline{\overline{P}}^{F}$ where

$$\underline{\overline{K}} = \frac{EI}{L^3 R}\begin{bmatrix} 12\,(r_1 + r_2 - r_1 r_2) & 6Lr_1(2 - r_2) & -12\,(r_1 + r_2 - r_1 r_2) & 6Lr_2(2 - r_1) \\ 6Lr_1(2 - r_2) & 4L^2 r_1(3 - 2r_2) & -6Lr_1(2 - r_2) & 2L^2 r_1 r_2 \\ -12\,(r_1 + r_2 - r_1 r_2) & -6Lr_1(2 - r_2) & 12\,(r_1 + r_2 - r_1 r_2) & -6Lr_2(2 - r_1) \\ 6Lr_2(2 - r_1) & 2L^2 r_1 r_2 & -6Lr_2(2 - r_1) & 4L^2 r_2(3 - 2r_1) \end{bmatrix}$$

$$\underline{\overline{P}}^{F} = \begin{bmatrix} F_{y1}^{F} - \dfrac{6}{LR}[(1-r_1)(2-r_2)M_{z1}^{F} + (1-r_2)(2-r_1)M_{z2}^{F}] \\ \dfrac{r_1}{R}[(4-3r_2)M_{z1}^{F} - 2(1-r_2)M_{z2}^{F}] \\ F_{y2}^{F} + \dfrac{6}{LR}[(1-r_1)(2-r_2)M_{z1}^{F} + (1-r_2)(2-r_1)M_{z2}^{F}] \\ \dfrac{r_2}{R}[-2(1-r_1)M_{z1}^{F} + (4-3r_1)M_{z2}^{F}] \end{bmatrix}$$

$$R = 12 - 8\,r_1 - 8\,r_2 + 5\,r_1 r_2 \qquad r_1 = \frac{k_1 L}{EI + k_1 L} \qquad r_2 = \frac{k_2 L}{EI + k_2 L}$$