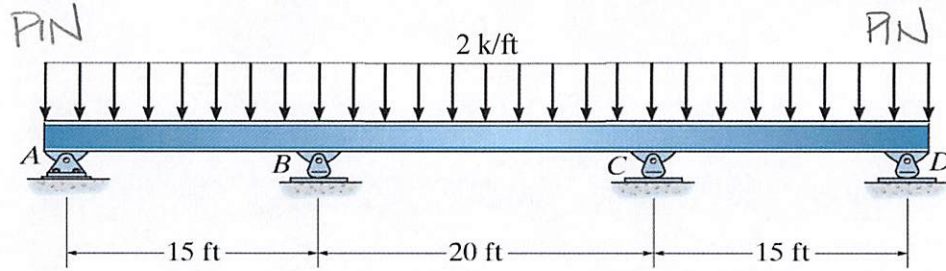


**Problem 11a-5** – Determine the internal moments at the supports. Assume  $EI$  is constant.



$$\text{PIN} \quad \frac{3EI}{L} \quad \frac{4EI}{L} \quad \frac{3EI}{L}$$

$$K_{BA} = \frac{3EI}{15'} = K_{BC} = \frac{4EI}{20'}$$

$$DF_{BA} = \frac{K_{BA}}{K_{BA} + K_{BC}} = \frac{1/5}{1/5 + 1/5} = 0.5$$

$$K_{CB} = \frac{4EI}{20} \quad K_{CD} = \frac{3EI}{15}$$

$$DF_{CB} = \frac{K_{CB}}{K_{CB} + K_{CD}} = \frac{1/5}{1/5 + 1/5} = 0.5$$

$$FEM_{BA} = FEM_{CD} \Rightarrow \frac{WL^2}{8} = \frac{(2\text{ k/ft})(15\text{ ft})^2}{8} = \pm 56.25\text{ kft}$$

$$FEM_{BC} = \frac{WL^2}{12} = \frac{2\text{ k/ft}(20\text{ ft})^2}{12} = \pm 66.67\text{ kft}$$

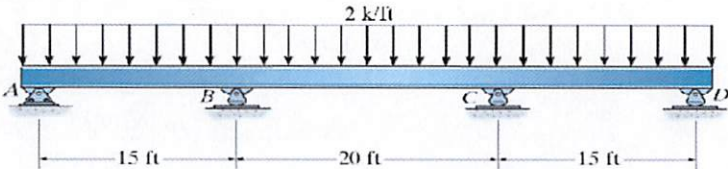
$$DF_{BC} = 0.5$$

$$DF_{CD} = 0.5$$

Example 11a-5

Determine the reactions at the supports. Assume A is fixed and B and C are rollers that can either push or pull on the beam. EI is constant.

| Joint   | AB   | B      |         | C      |         | D    |
|---------|------|--------|---------|--------|---------|------|
| Members | AB   | BA     | BC      | CB     | CD      | DC   |
| DF      | 1    | 0.500  | 0.500   | 0.500  | 0.500   | 1    |
| FEM     |      | 56.250 | -66.667 | 66.667 | -56.250 |      |
| Dist.   |      | 5.208  | 5.208   | -5.208 | -5.208  |      |
| CO      |      |        | -2.604  | 2.604  |         |      |
| Dist.   |      | 1.302  | 1.302   | -1.302 | -1.302  |      |
| CO      |      |        | -0.651  | 0.651  |         |      |
| Dist.   |      | 0.326  | 0.326   | -0.326 | -0.326  |      |
| CO      |      |        | -0.163  | 0.163  |         |      |
| Dist.   |      | 0.081  | 0.081   | -0.081 | -0.081  |      |
| Sum     | 0.00 | 63.167 | -63.167 | 63.167 | -63.167 | 0.00 |



$k_{BA}$   
 $DF_{BA}$

$3EI/L$   
0.5000

0.2000

$k_{BC}$   
 $DF_{BC}$

$4EI/L$   
0.5000

0.2000

$k_{CB}$   
 $DF_{CB}$

$4EI/L$   
0.5000

0.2000

$k_{CD}$   
 $DF_{BD}$

$3EI/L$   
0.5000

0.2000

$FEM_{BA}$

56.25 kN m

$FEM_{BC}$

66.67 kN m