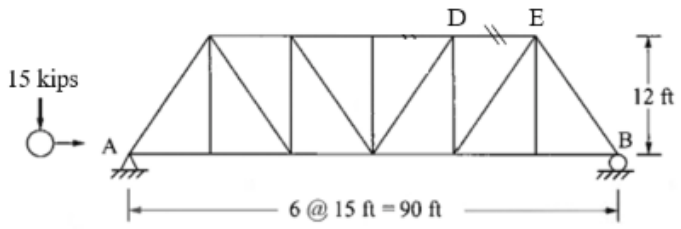
Structural Engineering Preparatory Quiz

1 Multiple Choice 1 point

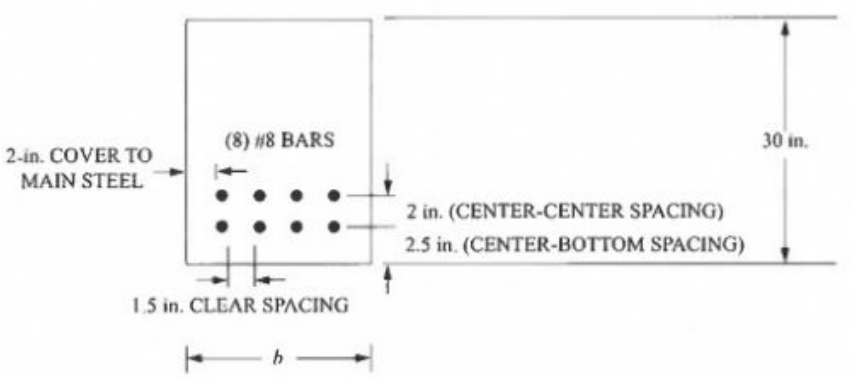
A concentrated load of 15 kips moves through the truss shown. Neglecting the weight of the truss, the maximum force (kips) in Member DE due to the moving load is most nearly:



- 37.5
- 25
- 31.25
- 18.75

2 Multiple Choice 1 point

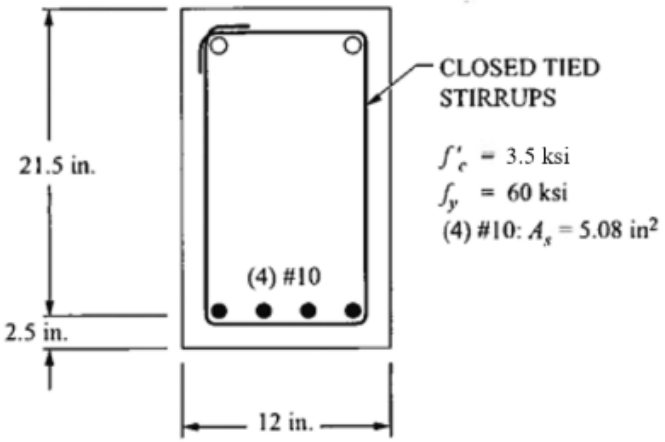
A reinforced concrete beam is subjected to a factored moment M_u = 621 ft-kips. For concrete, f'_c = 4,000 psi. For steel, f_y = 60,000 psi. The beam is reinforced with eight #8 bars in two rows, positioned as shown in the figure. Assume that Φ = 0.90. The minimum adequate overall width *b* for this beam is most nearly:



- 12
- 10
- 13
- 15

3 Multiple Choice 1 point

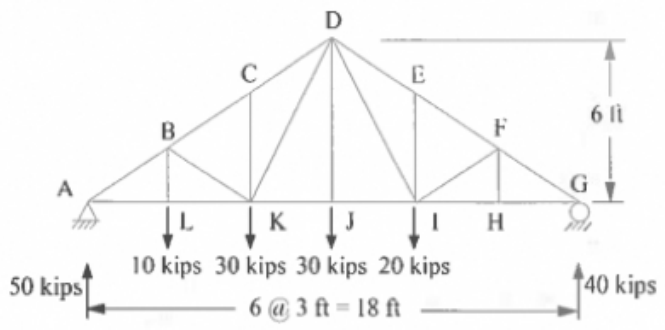
According to American Concrete Institute (ACI) 318-14, the value of Φ that should be used in computing the design moment strength ΦM_n for the beam section shown below is most nearly:



- 0.76
- 0.81
- 0.85
- 0.89

4 Multiple Choice 1 point

In the truss shown, there is a pin connecting the members at each joint. The force (kips) in Member JI is most nearly:

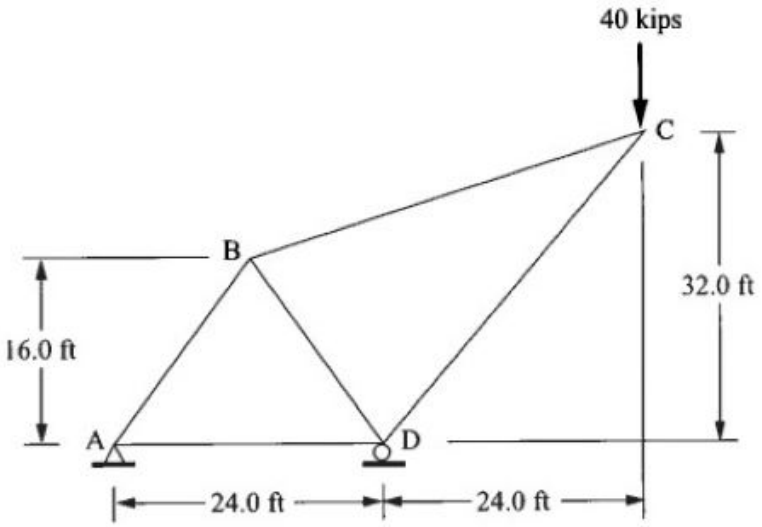


- -113 (compression)
- -81 (compression)
- 50 (tension)
- 75 (tension)

5 Multiple Choice 1 point

The 40-kip vertical load at Joint C in the steel truss shown below produces the forces given in the accompanying table. The cross-sectional area of each member is 4.0 in^2, and the length of each member is given in the table. The elastic modulus of steel is 29,000 ksi. The downward vertical displacement (in.) of Joint C is most nearly:

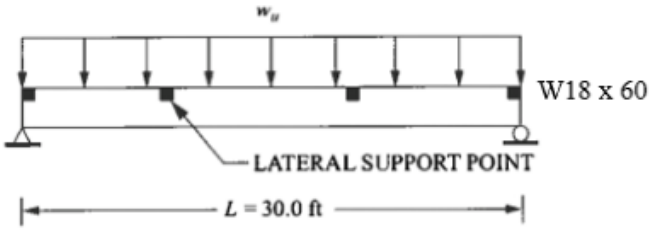
Member	Force, F (kips)	Length, L (in.)	$\frac{FL}{AE}$	f	$f \cdot \frac{FL}{AE}$
AB	50.0	240	0.1034	1.25	0.1292
BC	49.2	473	0.2008	1.231	0.2472
CD	–75.0	480	–0.3103	–1.875	0.5818
AD	–30.0	288	–0.0745	–0.75	0.0559
BD	–25.0	240	–0.0517	–0.625	0.0323



- 0.102
- 1.046
- 0.132
- 0.294

6 Multiple Choice 1 point

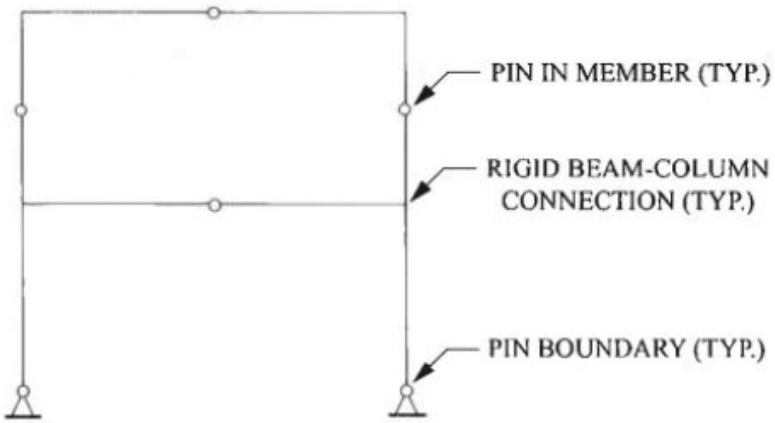
The W18 x 60 steel beam shown in the figure has its compression flange laterally braced at the one-third points over its full length. Assume F_y = 50 ksi and C_b = 1.0 for the critical segment. The maximum factored load w_u (kips/ft) that the beam can carry for this length is most nearly:



- 3.333
- 2.809
- 3.573
- 3.360

7 Multiple Choice 1 point

The frame in the figure below is:



- indeterminate two degrees
- indeterminate one degree
- stable and determinate
- unstable

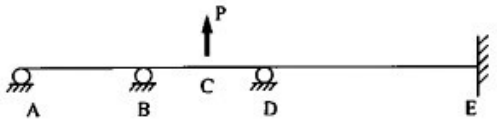
8 Multiple Choice 1 point

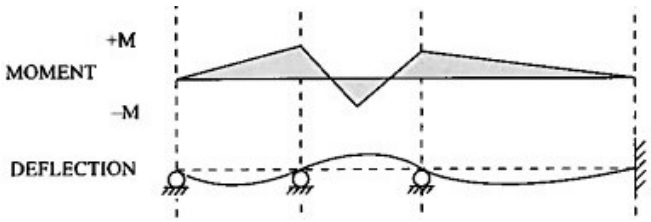
The proportional limit and modulus of elasticity for a material are 45 ksi and 32,000 ksi, respectively. A square column made from this material has a moment of inertia equal to 6.6 in^4 and an area equal to 8.8 in^2. Assume a fixed-pinned connected column. The **maximum** column length (in.) based on the Euler formula is most nearly:

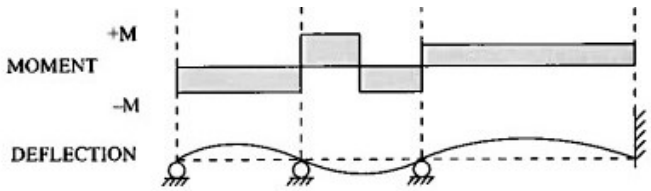
- 89.8
- 103.6
- 72.5
- 50.0

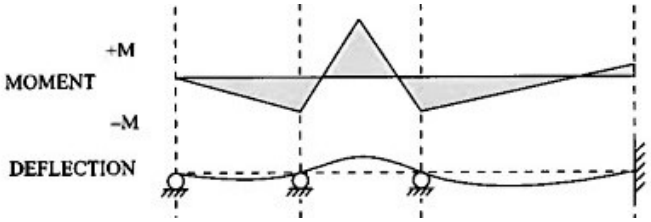
9 Multiple Choice 1 point

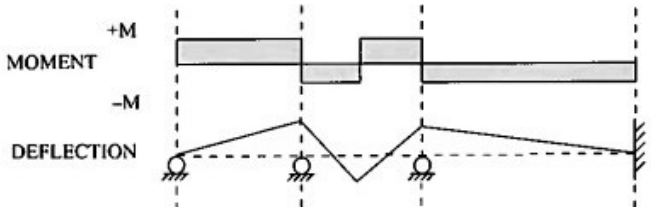
Which combination of moment diagram and deflection shape most accurately corresponds to the continuous beam with loading shown?





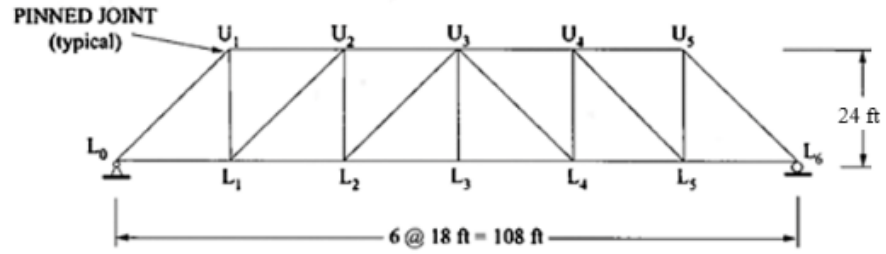


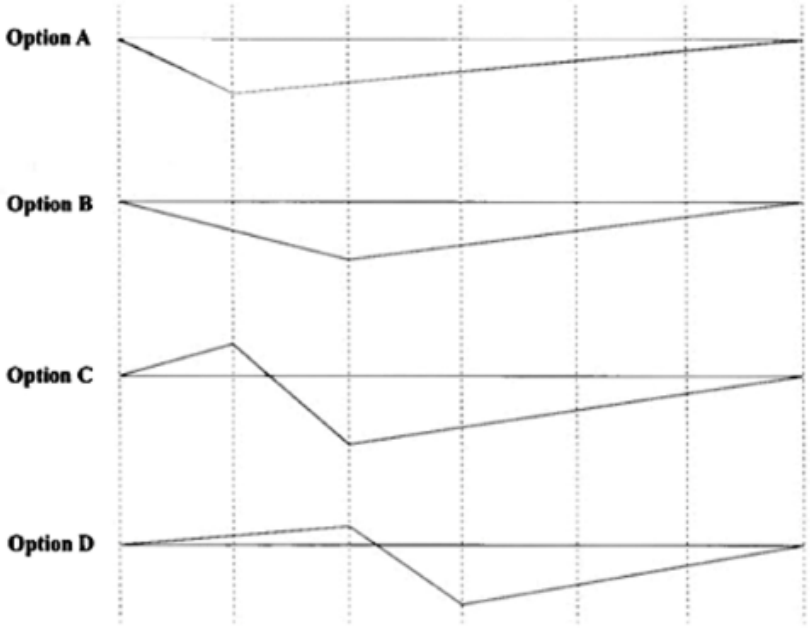




10 Multiple Choice 1 point

Which of the vertical-load influence lines shown below is correct for Member U_2U_3 of the truss shown below?





- Option A
- Option D
- Option B
- Option C