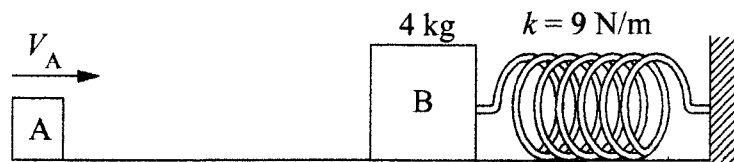38. In the figure below, Block B is initially at rest and is attached to an unstretched spring. Block A travels to the right and hits Block B. Immediately after impact, the velocity of Block B is 6 m/s to the right. The maximum acceleration (m/s^2) of Block B after impact is most nearly:


- A.   1.5
- B.   2.25
- C.   6.0
- D.   9.0

39. The shear diagram for a particular beam is shown below. All lines in the diagram are straight. The bending moment at each end of the beam is zero, and there are no concentrated couples along the beam. The maximum magnitude of the bending moment (kN·m) in the beam is most nearly:

- A.   8
- B.   16
- C.   18
- D.   26
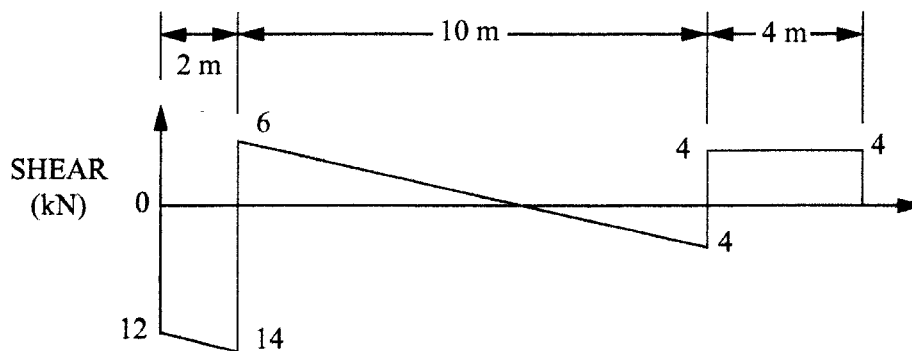
40. A 0.25-m steel rod with a cross-sectional area of 1,250 mm^2 and a modulus of elasticity E of 200 GPa is subjected to a 5,000-N force as shown below. The elongation of the rod (μm) is most nearly:
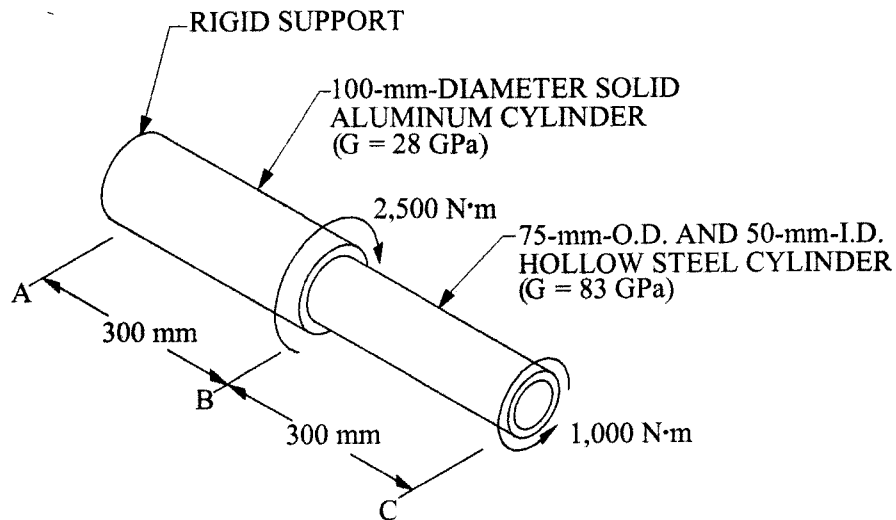

5,000 N ← ⊂━━━━━━━⊃ → 5,000 N

|← 0.25 m →|
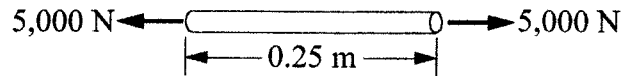
- ○ A. 2.4
- ○ B. 4.4
- ○ C. 5.0
- ○ D. 9.6

41. The piston of a steam engine is 50 cm in diameter, and the maximum steam gage pressure is 1.4 MPa. If the design stress for the piston rod is 68 MPa, its cross-sectional area (m^2) should be most nearly:

- ○ A. 40.4×10^{-4}
- ○ B. 98.8×10^{-4}
- ○ C. 228.0×10^{-4}
- ○ D. 323.0×10^{-4}

42. In the figure below, the value of the maximum shear stress (MPa) in Segment BC is most nearly:


- O A. 15.0
- O B. 30.0
- O C. 37.7
- O D. 52.7

43. A shaft of wood is to be used in a certain process. If the allowable shearing stress parallel to the grain of the wood is 840 kN/m², the torque (N·m) transmitted by a 200-mm-diameter shaft with the grain parallel to the neutral axis is most nearly:

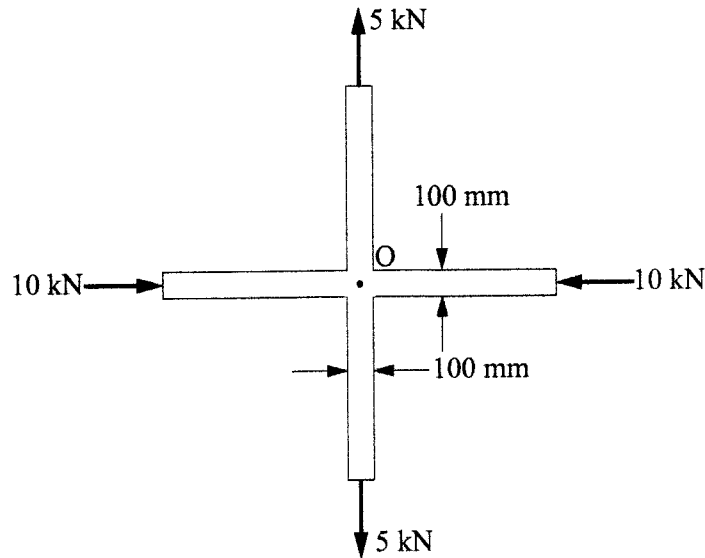- O A. 500
- O B. 1,200
- O C. 1,320
- O D. 1,500

44. The maximum inplane shear stress (ksi) in the element shown below is most nearly:

20 ksi

10 ksi

40 ksi

○ A. 10
○ B. 14.1
○ C. 44.1
○ D. 316
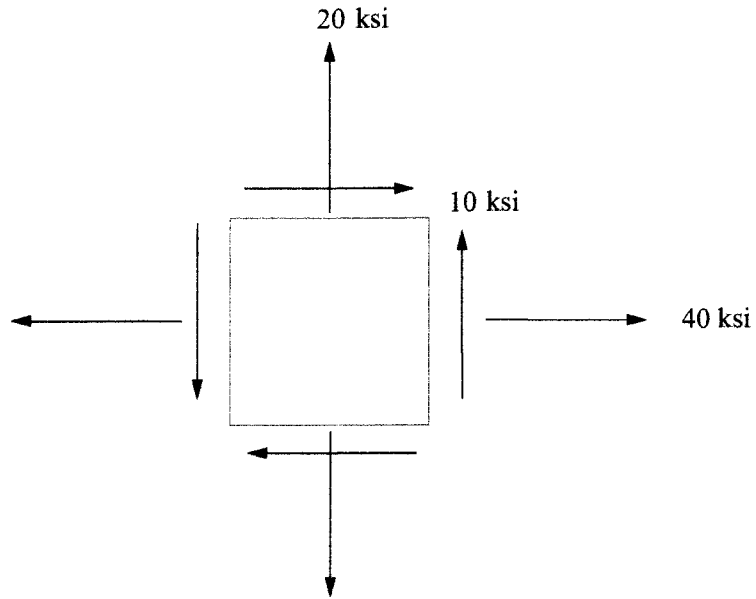
45. A plane member having a uniform thickness of 10 mm is loaded as shown below. The maximum shear stress (MPa) at Point O is most nearly:

5 kN

100 mm

10 kN → O ← 10 kN
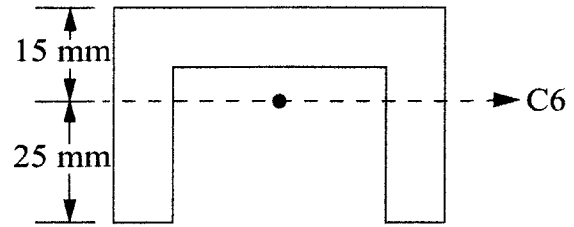
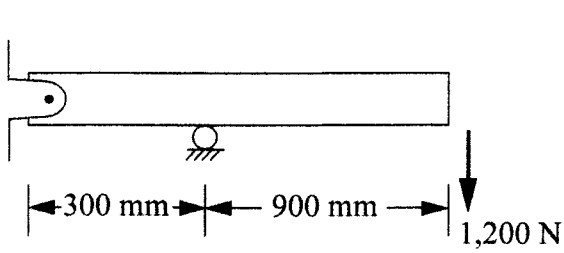← 100 mm

5 kN

- A.   2.5
- B.   5.0
- C.   7.5
- D.   10.0

46. The Euler formula for columns deals with:

- A.   relatively short columns
- B.   shear stress
- C.   tensile stress
- D.   elastic buckling

NEXT→

93. The beam is loaded as shown by a hanging 1,200-N force. The tensile stress (MPa) due to bending is most nearly:

300 mm ⟷ 900 mm

1,200 N

15 mm
25 mm
➤ C6

BEAM SECTION
$I_{C6} = 11 \times 10^4 \text{ mm}^4$

- O A.   49
- O B.   147
- O C.   196
- O D.   245

96.   A helical compression spring has a spring constant of 38.525 N/mm and a free length of 190 mm. The force (N) required to compress the spring to a length of 125 mm is most nearly:

    ○ A.   1,500
    ○ B.   2,500
    ○ C.   4,800
    ○ D.   6,500

97.   The pressure gage in an air cylinder reads 1,680 kPa. The cylinder is constructed of a 12-mm rolled-steel plate with an internal diameter of 700 mm. The tangential stress (MPa) inside the tank is most nearly:

    ○ A.   25
    ○ B.   50
    ○ C.   77
    ○ D.   100

98. The figure below shows an unpressurized vessel. Material properties are given with the figure.

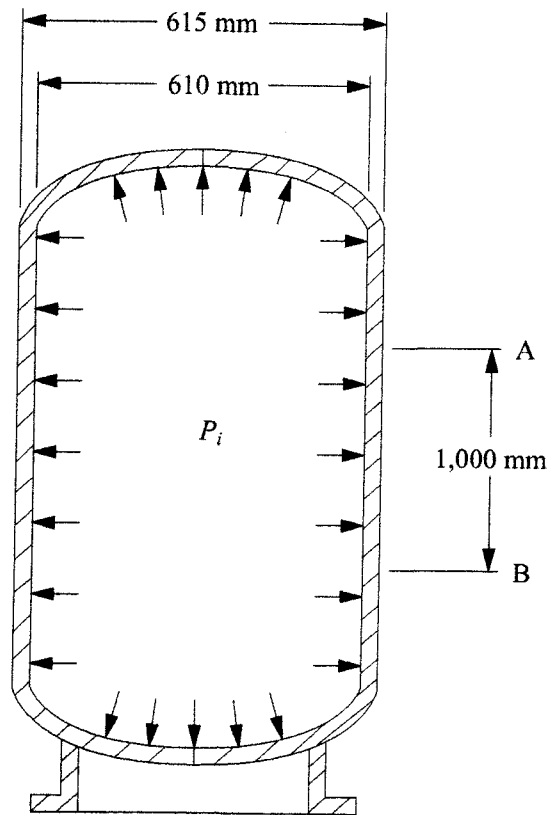MATERIAL PROPERTIES:

$E = 210 \times 10^3$ MPa

$v = 0.24$

$\alpha = 10.5 \times 10^{-6}/°C$

$S_y = 400$ MPa

615 mm

610 mm

P_i

1,000 mm

A

B

VERTICAL-AXIS PRESSURE VESSEL SECTION

Assume the internal pressure is increased to P_i such that the stresses in the wall between Locations A and B are:

$\sigma_t = 46.2$ MPa

$\sigma_l = 23.1$ MPa

$\sigma_r = 0$

The increase in length (mm), along the outer wall, of the distance between Locations A and B due to the increase in pressure is most nearly:

- ○ A.   0.06
- ○ B.   0.11
- ○ C.   0.19
- ○ D.   0.22

99. The figure below shows a pressure vessel with an internal pressure P_i. Material properties are given with the figure.

MATERIAL PROPERTIES:

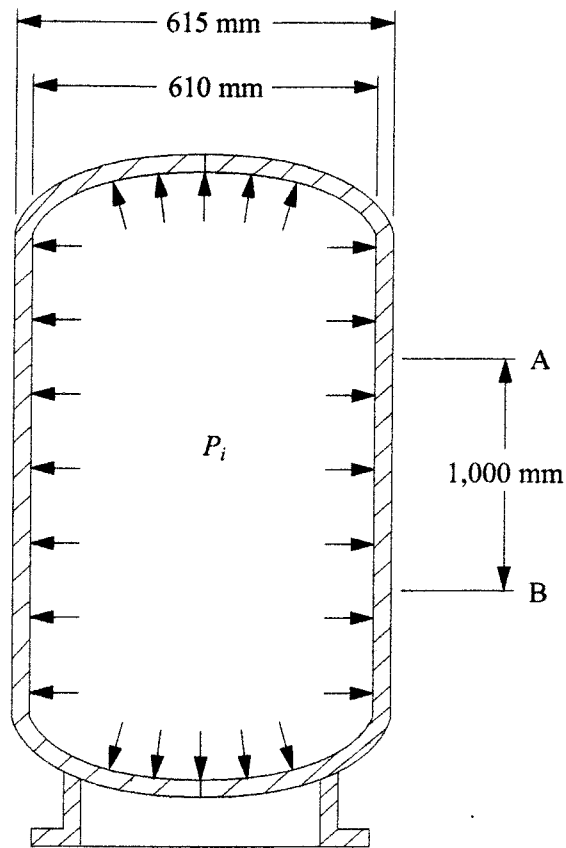$E = 210 \times 10^3$ MPa

$v = 0.24$

$\alpha = 10.5 \times 10^{-6}/°C$

$S_y = 400$ MPa

VERTICAL-AXIS PRESSURE VESSEL SECTION

If the internal pressure in the cylindrical pressure vessel shown is 600 kPa, the hoop or tangential stress (MPa) in the vessel wall between Cross Sections A and B is most nearly:

- ○ A. 18.4
- ○ B. 36.8
- ○ C. 73.5
- ○ D. 147