

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Determine the components of the forces acting on each member of the frame shown in Figure 1. (20%)
2. The double gear shown in Figure 2 rolls on the stationary lower rack; the velocity of its center A is 1.2 m/s directed to the right. Determine (a) the angular velocity of the gear, (b) the velocities of the upper rack R and of point D of the gear. (20%)
3. Determine the slope at point C for the steel beam in Figure 3. Take $E_{st} = 200 \text{ Gpa}$, $I = 17(10^6) \text{ mm}^4$. (20%)
4. A steel bar having a rectangular cross section is shaped into a circular arc as shown in Figure 4. If the allowable normal stress is $\sigma_{allow} = 20 \text{ ksi}$, determine the maximum bending moment M that can be applied to the bar. What would this moment be if the bar was straight? (20%)
5. The two solid steel shafts shown in Figure 5 are coupled together using the meshed gears. Determine the angle of twist of end A of shaft AB when the torque $T=45 \text{ N}\cdot\text{m}$ is applied. Take $G= 80 \text{ Gpa}$. Shaft AB is free to rotate within bearings E and F, whereas shaft DC is fixed at D. Each shaft has a diameter of 20 mm. (20%)

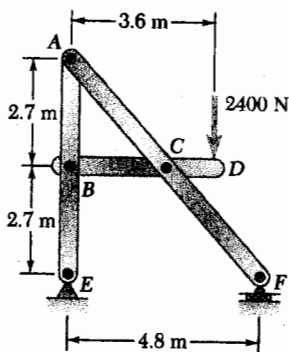


Fig. 1

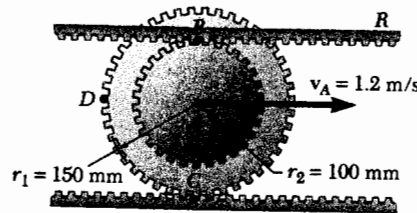


Fig. 2

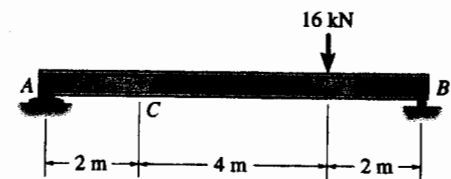


Fig. 3

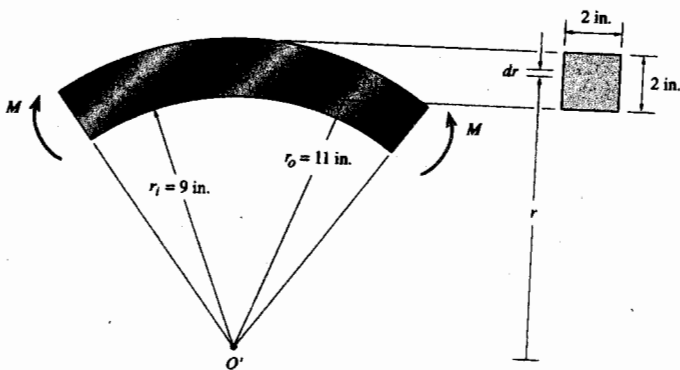


Fig. 4

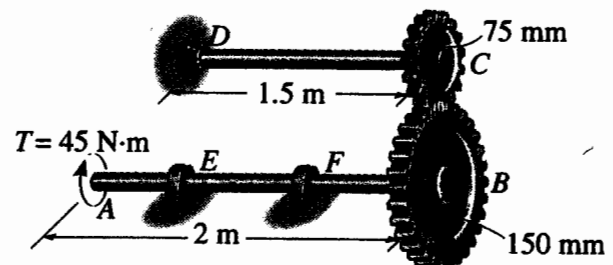


Fig. 5