

淡江大學 102 學年度日間部轉學生招生考試試題

系別：機械與機電工程學系三年級

科目：工程力學(含靜力學、動力學、材料力學)

考試日期：7月24日(星期三) 第3節

本試題共 6 大題， 2 頁

1. The plate in Fig.1 is supported by hinges at A and B and the cable CE . The properly aligned hinges do not exert couples on the plate, and the hinge at A does not exert a force on the plate in the direction of the hinge axis. Determine the reactions at the hinges and the tension in the cable. (15%)
2. The beam in Fig.2 is subjected to two distributed loads. Determine the reactions at A and B . (15%)

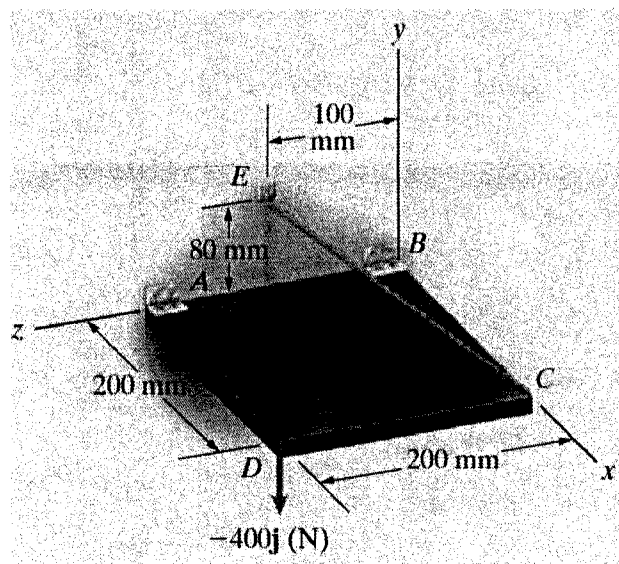


Fig.1

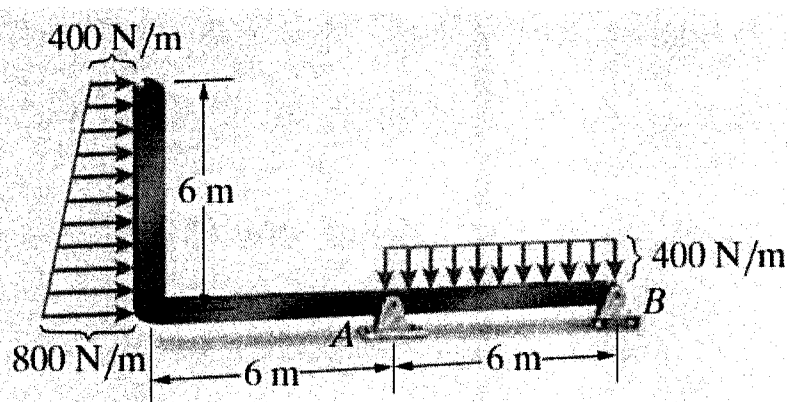


Fig.2

3. In Fig.3 the cam-follower mechanism shown, the slotted bar rotates with constant angular velocity $\omega = 4 \text{ rad/s}$, and the radial position of the follower is determined by the elliptic profile of the stationary cam. The path of the follower is described by the polar equation $r = \frac{0.15}{1 + 0.5 \cos \theta}$ m. Determine the velocity of the follower when $\theta = 45^\circ$ in terms of (a) polar coordinates and (b) cartesian coordinates. (15%)
4. Bar AB rotates with a clockwise angular velocity of 10 rad/s . What is the vertical velocity v_R of the rack of the rack-and-pinion gear? (15%)

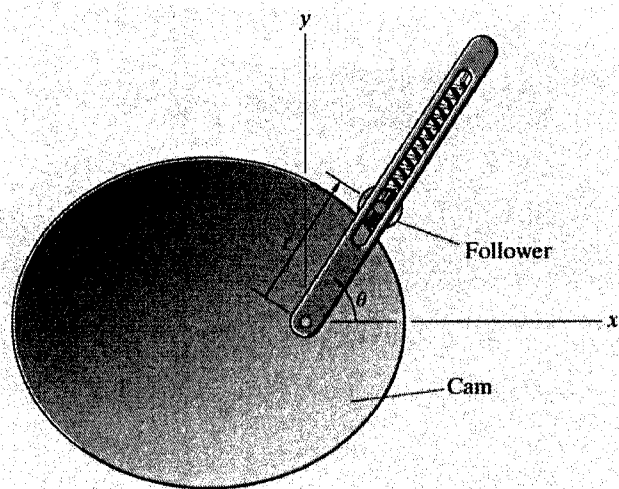


Fig.3

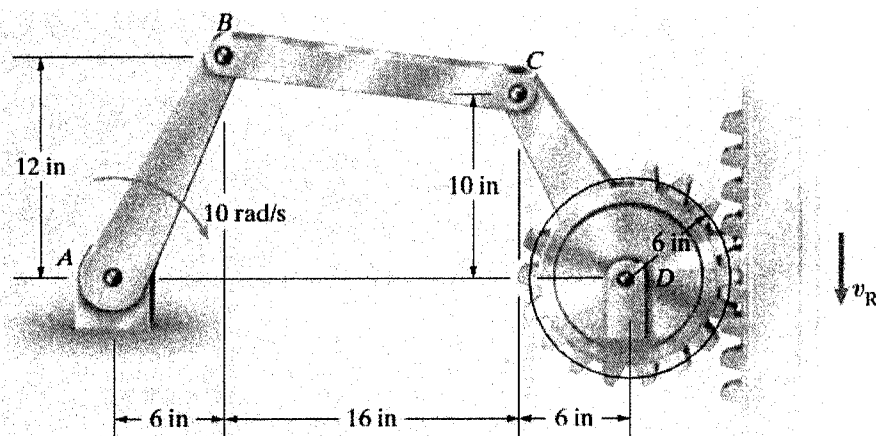


Fig.4

本試題雙面印刷

淡江大學 102 學年度日間部轉學生招生考試試題

系別：機械與機電工程學系三年級

科目：工程力學(含靜力學、動力學、材料力學)

考試日期：7月24日(星期三) 第3節

本試題共 6 大題， 2 頁

5. The horizontal rigid beam $ABCD$ is supported by vertical bars BE and CF and is loaded by vertical forces $P_1 = 400\text{kN}$ and $P_2 = 360\text{kN}$ acting at points A and D , respectively (see Fig.5). Bars BE and CF are made of steel ($E = 200\text{GPa}$) and have cross-sectional areas $A_{BE} = 11100\text{mm}^2$ and $A_{CF} = 9280\text{mm}^2$. The distances between various points on the bars are shown in the figure. Determine the vertical displacements δ_A and δ_D of points A and D , respectively. (20%)

6. A stepped shaft ABC consisting of two solid circular segments is subjected to torques T_1 and T_2 acting in opposite directions, as shown in Fig.6. The larger segment of the shaft has a diameter of $d_1 = 58\text{mm}$ and length $L_1 = 760\text{mm}$; the smaller segment has a diameter of $d_2 = 45\text{mm}$ and length of $L_2 = 510\text{mm}$. The material is steel with shear modulus $G = 76\text{GPa}$, and the torques are $T_1 = 2300\text{N}\cdot\text{m}$ and $T_2 = 900\text{N}\cdot\text{m}$.

- (a) Calculate the maximum shear stress τ_{\max} in the shaft and the angle of twist ϕ_c (in degrees) at end C . (10%)
- (b) If the maximum shear stress in BC must be the same as that in AB , what is the required diameter of segment BC ? What is the resulting twist at end C ? (10%)

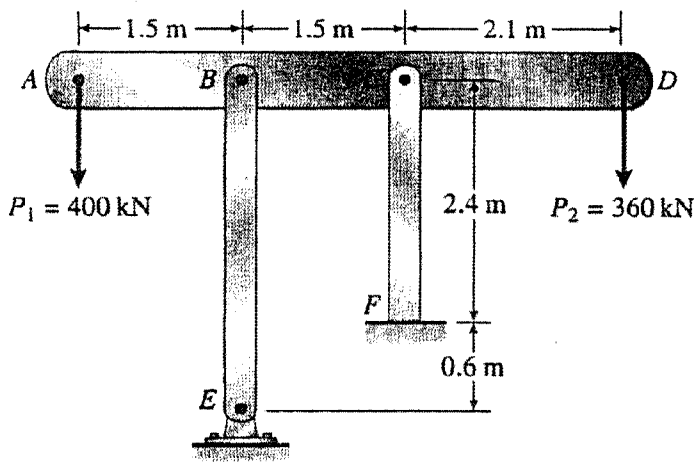


Fig.5

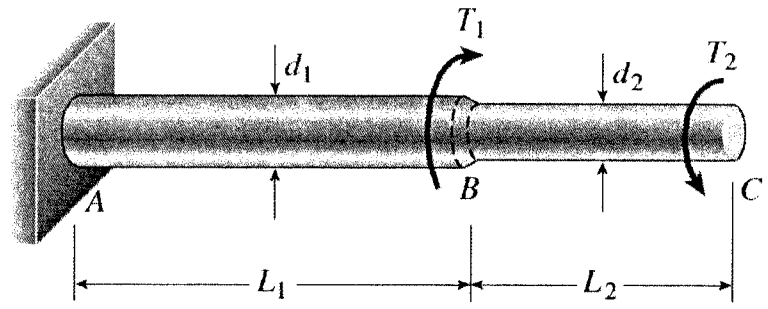


Fig.6