

國立臺灣師範大學 100 學年度碩士班招生考試試題

科目：應用力學

適用系所：機電科技學系

注意：1.本試題共 4 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則不予計分。

1. The crate, supported by the shear-leg derrick, creates a force of $F_B = 600\text{ N}$ along strut AB and $F_C = 900\text{ N}$ along cable AC . Represent each force as a Cartesian vector. (10 分)

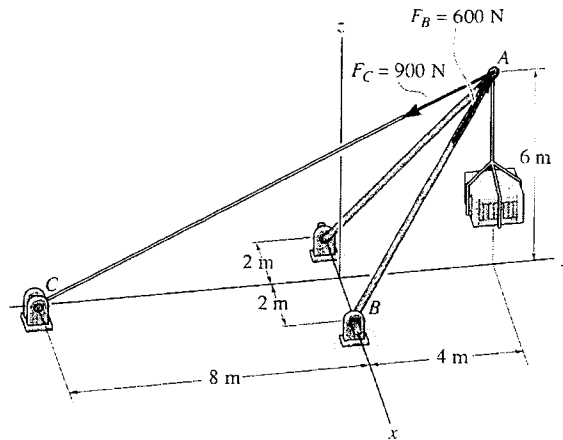


Fig.1

2. Determine the force in each member of the truss and state if the members are in tension or compression. Assume each joint as a pin. Set $P = 8\text{ kN}$. (15 分)

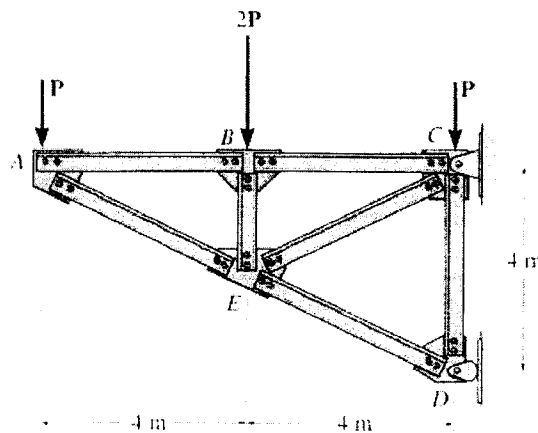


Fig.2

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3. Determine the shear force and moment at points C and D . (15 分)

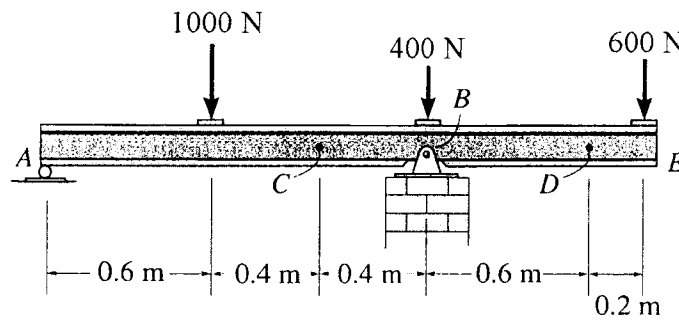


Fig.3

4. Locate the centroid (\bar{x}, \bar{y}) of the member's cross-sectional area. (10 分)

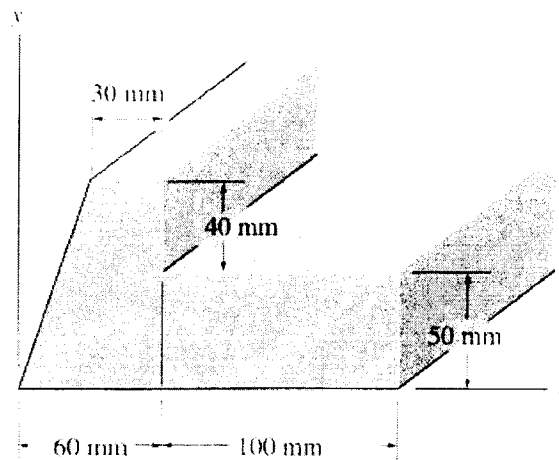


Fig.4

5. Balls A and B have identical mass m , and both are suspended from cords of length L . Ball A is released from rest at angle ϕ ($0 < \phi < 0.5\pi$) and swings down to strike B at lowest point. Determine (1) the speed of each ball just after impact and (2) the maximum angle θ through which B will swing. The coefficient of restitution between the balls is e . (12 分)

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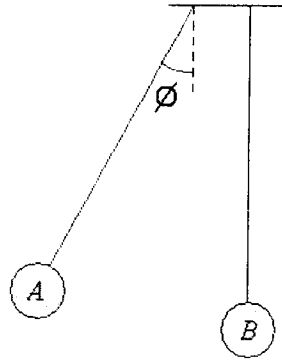


Fig.5

6. A crate with mass m lies against the cushion for which the coefficient of static friction is μ_s . If the cushion rotates about the z axis with a constant angular speed ω , (1) What happen to the crate when $\theta = 0^\circ$? Increasing the value of angle θ of the cushion, determine the value of θ at which the crate will change its condition on the cushion, (2) What happen to the crate when $\theta = 90^\circ$? Decreasing the value of angle θ of the cushion, determine the value of θ at which the crate will change its condition on the cushion. Given: $m = 80\text{kg}$, $r = 4\text{m}$, $\omega = 1.5\text{rad/s}$, $\mu_s = 0.5$. (14 分)

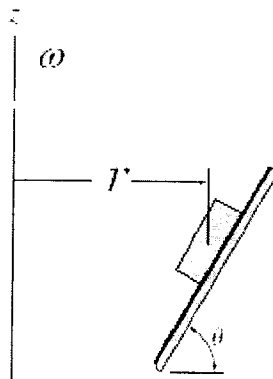


Fig.6

7. Rod AB moves to the left at a speed of v and an acceleration of a . At the instant θ , determine (1) the angular velocity and (2) angular acceleration of rod CD. (12 分)

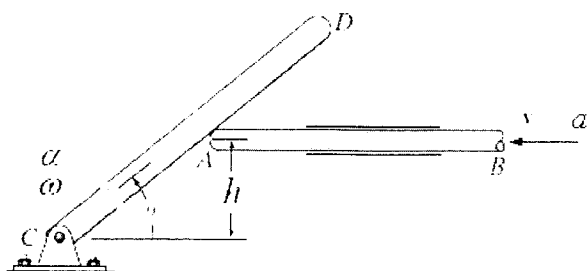


Fig.7

8. The wheel has a mass M and a radius of gyration k_G . If it rolls without slipping down the inclined plank, determine the horizontal and vertical components of reaction at A, and the normal reaction at the smooth support B at the instant the wheel is located at the midpoint of the plank. The plank has negligible thickness and has a mass m . (12 分)

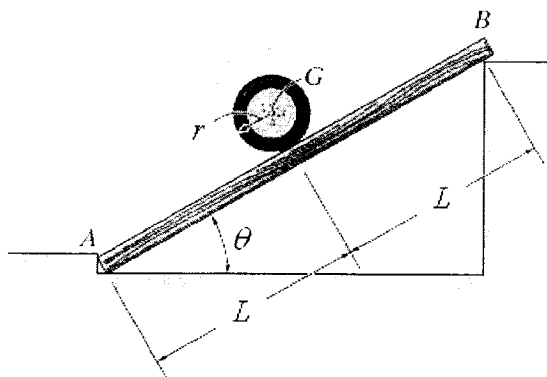


Fig.8