

※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. The toggle clamp is subjected to a force F at the handle (Figure 1). Determine the vertical clamping force acting at E . (20%)

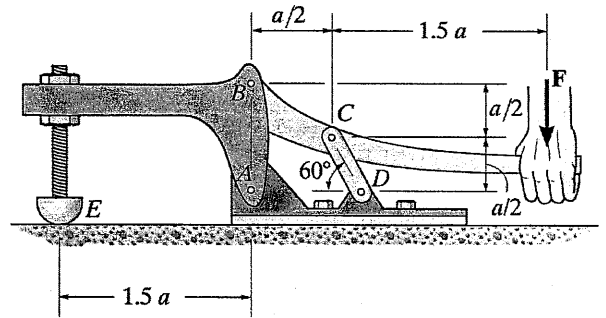


Figure 1

2. As an airplane's brakes are applied, the nose wheel exerts two forces on the end of the landing gear as shown in Figure 2. Determine the horizontal and vertical components of reaction at the pin C and the force in strut AB . (Please identify the two-force member) (20%)

note: $\tan(\pi/9)=0.364$, $\sin(\pi/3.6)=0.766$, $\cos(\pi/3.6)=0.6428$

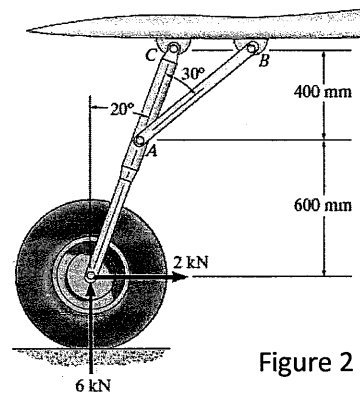


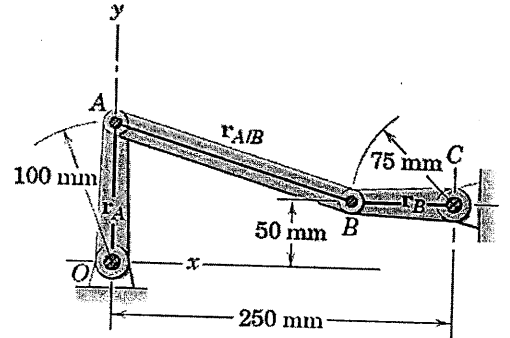
Figure 2

※ 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。

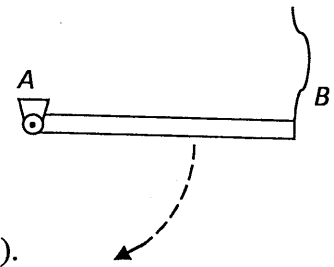
3. (20%) Let the mass center be at the midpoint of each of the link on the mechanism as shown in the right. Link OA has a constant angular speed of 1 rad/sec . At the instant when OA is upward vertically, find

$(\tan^{-1}(50/175) = \theta = 16^\circ, \sin \theta = 0.28, \cos \theta = 0.96)$

- (1) the coordinates of the mass center of all the links, (3%)
- (2) the instantaneous center of rotation of AB, (2%)
- (3) the angular velocity of link AB and BC, (5%)
- (4) the velocity of the mass center of link AB and BC, (5%)
- (5) the angular acceleration of link AB and BC. (5%)



4. (20%) A uniform rod of weight mg and length L is supported at horizontal position by a pin connection at point A and a wire of negligible mass at point B as shown in the right, (the mass moment of inertia about its center of gravity is $mL^2/12$ and about point A is $mL^2/3$).



- (1) What is the reaction force on pin A at the instant when the wire is released? (5%)
- (2) What is the force at pin A when the rod has rotated 30° ? (5%)
- (3) At which position (angle) will the reaction force on the vertical direction at pin A be zero? (5%)
- (4) Calculate the time from the horizontal position to vertical position. (5%)

5. (20%) Describe the following terms and specify the associated equation(s) (4% each)

- (1) Newton's laws of motion and inertial reference frame.
- (2) Kepler's laws of motion, perigee and apogee.
- (3) Principle of conservation of angular momentum.
- (4) Principle of conservation of mechanical energy
- (5) Coefficient of restitution.