

國立成功大學

113學年度碩士班招生考試試題

編 號：130

系 所：航空太空工程學系

科 目：工程力學

日 期：0201

節 次：第 2 節

備 註：不可使用計算機

※ 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. With reference to Fig. 1, if the applied load 100 N is moved to point O , how much force couple (N-m) should be applied at the point O such that the resultant moment at point A shall remain unchanged? (20%)

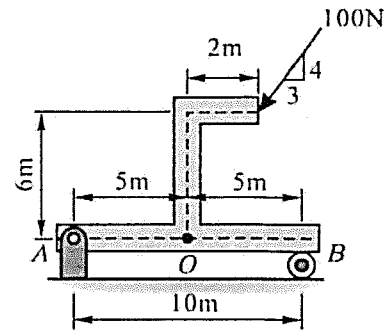


Figure 1: Problem 1

2. Determine the reaction forces at point A and point B as shown in Fig. 2. (20%)

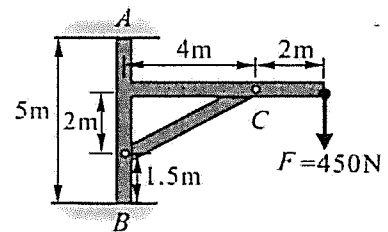
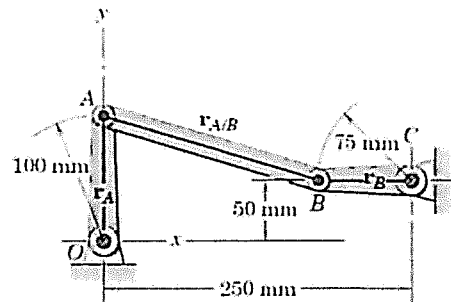


Figure 2: Problem 2

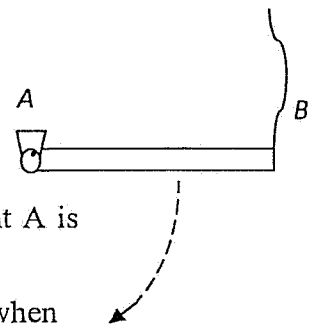
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3. (20%) Let the mass center be at the midpoint of each of the link on the mechanism as shown in the right. Link OA has a constant angular speed of 1 rad/sec . At the instant when OA is upward vertically with $\tan^{-1}(50/175) = \theta = 16^\circ$, $\sin \theta = 0.28$, and $\cos \theta = 0.96$, find

- (1) the instantaneous center of rotation of AB, (2%)
- (2) the angular velocity of link AB and BC, (5%)
- (3) the velocity of the mass center of link AB, (3%)
- (4) the angular acceleration of link AB and BC. (5%)
- (5) Consider the mass and moment of inertia of link AB be m and I , draw the free body diagram of link AB and write its dynamics equation(s) with gravitation in the $-y$ direction. (5%)



4. (20%) A uniform rod of weight mg and length L is supported at horizontal position by a pin connection at point A (left) and a wire of negligible mass at point B (right) 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 in x-y direction on pin A at the instant when the wire is released? (5%)
- (2) What is the force in x-y direction at pin A when the rod has rotated 45° ? (5%)
- (3) Calculate the mass center velocity and acceleration in x-y direction when it is at vertical position. (5%)
- (4) Calculate the time from the horizontal position to vertical position. (5%)

5. (20%) A spherical rigid body of mass m , radius r and radius of gyration k is released from stationary in an incline plane of angle θ and coefficient of friction μ_k .

- (1) Determine the normal reaction force, friction force, linear and angular accelerations when it is NOT in pure rolling motion. (2% each)
- (2) Determine the normal reaction force, friction force, linear and angular accelerations when it is in pure rolling motion. (3% each)

