

立中央大學八十九學年度碩士班研究生入學試題卷

別： 機械工程學系 丁組 科目： 丁動力學 共 | 頁 第 | 頁

1. 簡答題：

(a) (14 %) 請描述以下的兩種運動形態，並畫出加速度的方向：

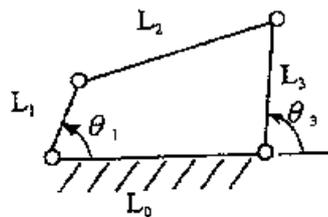
- (1) constant speed and constant velocity
- (2) constant speed and nonconstant velocity

(b) (11 %) Consider a nonlinear spring with the force $F = K (X - X_0)^2$. Derive its elastic potential energy.

2. (25 %)

Consider a four-bar linkage has the following link lengths:

- Link 0, fixed : 120 mm
- Link 1, input : 40 mm
- Link 2, coupler: 100 mm
- Link 3, output: 80 mm

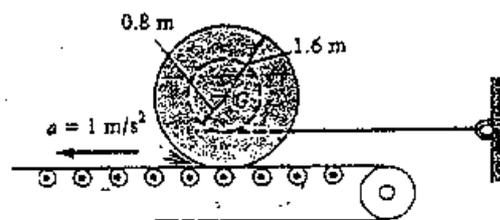


- (a) Find the orientation of output link 3 (θ_3) when the input link $\theta_1 = 60^\circ$. 6%
- (b) Find the total rocking angle of output link 3, ($\Delta \theta_3$). 6%
- (c) Find the maximum and minimum transmission angles of the linkage. 6%
- (d) Find the range of fixed link length (L_0) for which the linkage can always act as a crank-rocker mechanism. 7%

3. (25 %)

The spool has a mass of 500 kg and a radius of gyration $k_G = 1.3$ m. It rests on the surface of a conveyor belt for which $\mu = 0.4$. The spool is originally at rest. If the conveyor accelerates at $a = 1 \text{ m/s}^2$,

- (1) please draw the free-body and kinetic diagram completely (8 %). In addition,
- (2) determine the initial tension in the wire and the angular acceleration of the spool. (17 %)



4. (25 %)

A 3-kg uniform slender bar 150 mm long is in equilibrium in the horizontal position. When E is displaced down a small amount and released, the amplitude of each peak of the oscillation is observed to be 0.9 of the amplitude of the previous peak. If the spring constant $k = 400 \text{ N/m}$, determine (a) The value of the damping coefficient c , (b) The damped circular frequency ω_d of the resulting

