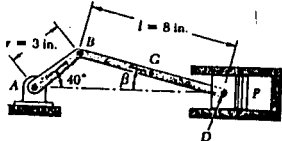
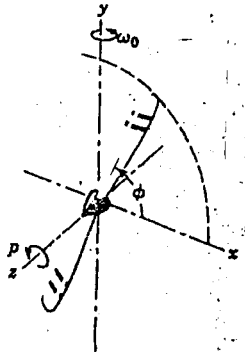


1. (a). 何謂慣性?
- (b). 何謂慣性力? 為何又稱假力?
- (c). D'Alembert 原理之物理意義為何? (15%)

2. Please explain physically the reason for steady precession using $M=H\dot{\phi}$. (10%)

3.  Crank AB of the engine system has a constant clockwise angular velocity 2000 rpm. For the crank position shown, determine the angular acceleration of the connecting rod BD and the acceleration of point D. (20%)

4.  The two-bladed airplane propeller has a constant rotational speed p about its shaft axis z and a moment of inertia I about this same axis. The airplane is turning

(20%)

with a constant angular velocity ω_0 about the y-axis which remains vertical. A moment M_B acting on the propeller is supported by bending of the shaft, and the moment M_z is supported by torsion of the shaft. Determine each moment as a function of $\phi = p\tau$. (20%)

5. (a). 何謂虛位移？與真正的位移有何不同？

(b). 如果 $W = F \cdot X$ ，即功 = 力 \times 位移，則

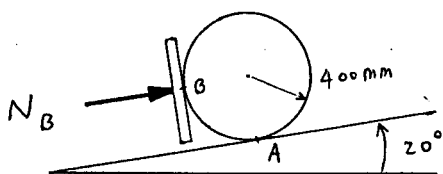
$$\delta W = \delta F \cdot X + F \cdot \delta X$$

是否可以據此定義一虛力？應如何定義？

是否可以由虛力 δF 來定義虛功 δW ？應如何定義？

(c). 虛功原理與最小位能原理有何異同？ (15%)

6.



A 100 kg steel pipe of radius 400 mm is pushed up the 20° incline at constant velocity as shown

in the figure. The coefficients of static and

(較不熟)

kinetic friction at the points of contact are

$$(\mu_s)_A = 0.18, (\mu_k)_A = 0.15 \text{ and } (\mu_s)_B = 0.45,$$

$$(\mu_k)_B = 0.4.$$

- (a). List out the unknowns and the independent equations. Are the number of unknowns and independent equations the same?
- (b). Determine the normal force N_B .
- (c). Does the pipe roll up the incline or slide up the incline? Explain it. (20%)