

## 國立臺灣科技大學

## 九十二學年度碩士班招生考試試題

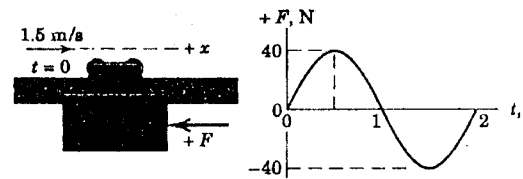
系所組別：機械工程系碩士班甲組、機械工程系碩士班丁組

科目：動力學

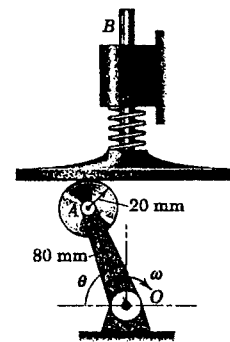
(總分 100 分)

共四題，每題 25 分，可不依序作答，但題號務請標示清楚。解答時必須註明解題所依據之定律或原理。自由體圖需簡明繪製於答案卷上；向量與純量須依不同之標示方法表示。

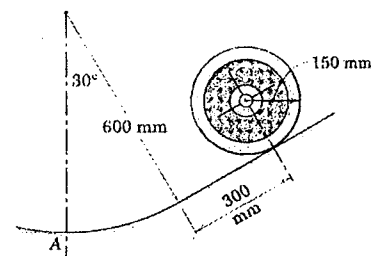
1. The 30-kg carriage moves with negligible friction along the horizontal rail under the action of the sinusoidal force  $F = 40 \sin \pi t$  in newtons measured positive to the left as shown. If the carriage has a velocity of 1.5 m/s to the right at  $t = 0$ , determine the velocity  $v_1$  of the carriage when  $t = 1$  s. By inspection, what is the velocity  $v_2$  of the carriage when  $t = 2$  s?



2. Determine the acceleration of the shaft  $B$  for  $\theta = 60^\circ$  if the crank  $OA$  has an acceleration  $\ddot{\theta} = 8 \text{ rad/s}^2$  and an angular velocity  $\dot{\theta} = 4 \text{ rad/s}$  at this position. The spring maintains contact between the roller and the surface of the plunger.



3. The center of the 100-kg wheel with centroidal radius of gyration of 100 mm has a velocity of 0.6 m/s down the incline in the position shown. Calculate the normal reaction  $N$  under the wheel as it rolls past position  $A$ . Assume that no slipping occurs.



4. Car  $B$  is rounding the curve with a constant speed of 54 km/h, and car  $A$  is approaching car  $B$  in the intersection with a constant speed of 72 km/h. Determine the velocity which car  $A$  appears to have, to an observer riding in and turning with car  $B$ . The  $x$ - $y$  axes are attached to car  $B$ . The distance separating the two cars at the instant depicted is 40 m.

