國立虎尾科技大學 103 學年度第二學期博士班資格考試題

所別：動力機械系機械與機電工程博士班本試題
科目：動力學

注意事項：
（1）本試題共有 4 題，每題 25 分，合計一百分。
（2）請依序作答於答案卷上並註明題號，若未註明選答題號及超過規定題數時，謹採計作答順序較前之題目計分。
（3）可使用計算機，本試題為 close book 考試

1. The acceleration of a particle traveling along a straight line is $a = 0.02e^t$, where t is in seconds. If $v = 0$, $s = 0$ when $t = 0$, determine the velocity and acceleration of the particle at $s = 4$ m. (Hint: Solving the position equation by trial and error)

2. As shown in Fig. 1, if the cam rotates clockwise with a constant angular velocity of $\dot{\theta} = 5$ rad/sec, determine the magnitudes of the velocity and acceleration of the follower rod AB at the instant $\theta = 30°$. The surface of the cam has a shape defined by $r = (200 + 100\cos\theta)$ mm.

3. As shown in Fig. 2, rotation of the robotic arm occurs due to linear movement of the hydraulic cylinders A and B. If this motion causes the gear at D to rotate clockwise at 5 rad/sec, determine the magnitude of velocity and acceleration of the part C held by the grips of the arm.

4. As shown in Fig. 3, piston P moves upward with a velocity of 7.5 m/s at the instant shown. Determine the angular velocity of the crankshaft AB at this instant.
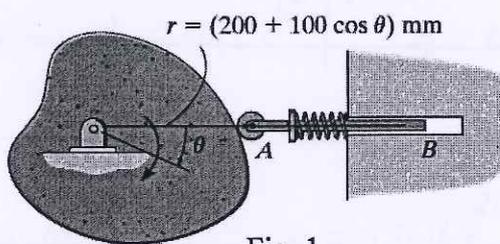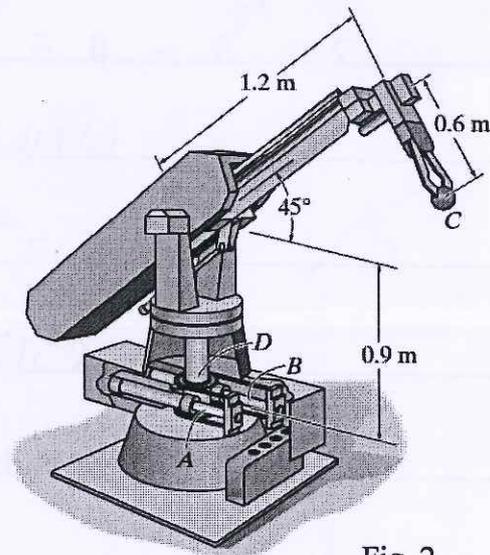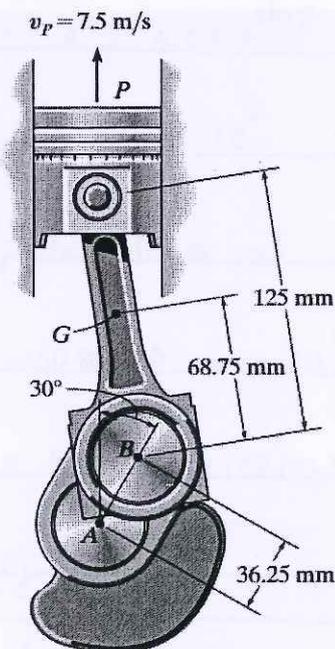
$r = (200 + 100 \cos \theta)$ mm

Fig. 1

Fig. 2

$v_P = 7.5$ m/s

125 mm

68.75 mm

$30°$

36.25 mm

Fig. 3

1.2 m

0.6 m

$45°$

C

D

B

0.9 m

A