Name : _____ Student ID # : _____

คณะวิศวกรรมศาสตร์
มหาวิทยาลัยสงขลานครินทร์

การสอบปลายภาค ประจำภาคการศึกษาที่ ๒ ประจำปีการศึกษา ๒๕๕๓
วันพุธที่ ๒๓ กุมภาพันธ์ พ.ศ. ๒๕๕๔ เวลา ๑๓.๓๐-๑๖.๓๐ น.
วิชา ๒๑๕-๓๒๔ / ๒๑๖-๓๒๔ : กลศาสตร์เครื่องจักรกล ห้องสอบ S201

ทุจริตในการสอบ ปรับขั้นต่ำคือปรับตกในรายวิชาที่ทุจริต และพักการเรียน ๑ ภาคการศึกษา

คำสั่ง

๑. ข้อสอบมีทั้งหมด ๕ ข้อ ให้ทำลงในข้อสอบทุกข้อ
๒. อนุญาตให้ใช้เครื่องคิดเลขได้
๓. ให้ใช้เครื่องมือเขียนแบบได้
๔. ไม่อนุญาตเอกสารอื่น ๆ

รศ.ดร. วรวุธ วิสุทธิ์เมธางกูร
ผู้ออกข้อสอบ

ข้อ	*คะแนนเต็ม*	*ได้*
๑	๒๐	
๒	๒๐	
๓	๒๐	
๔	๒๐	
๕	๒๐	
รวม	๑๐๐	

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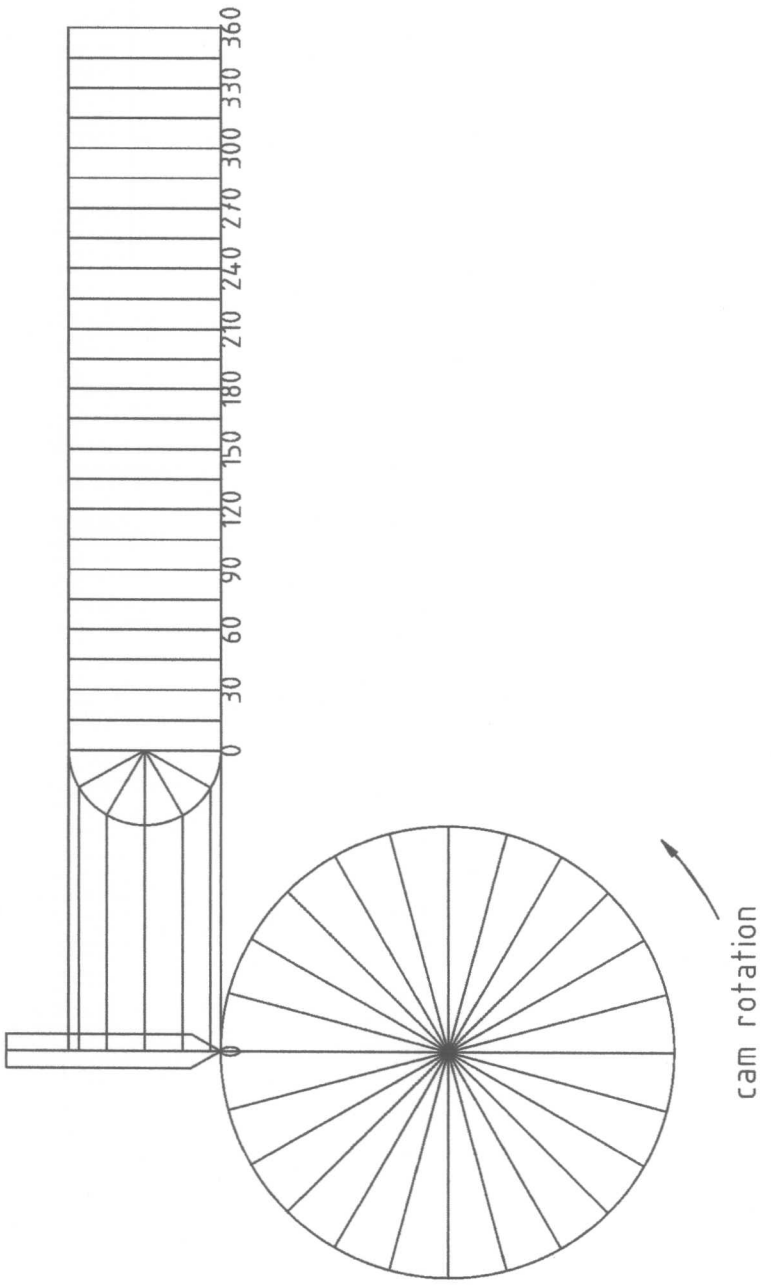
1) (a) The knife-edge follower of a plate cam is to rise 2 cm with simple harmonic motion in 90° of cam rotation, dwell for 120°, return with simple harmonic motion in 90°, and dwell for the remaining 90°. If the prime-circle radius is 3 cm, draw the displacement diagram, and the cam profile for counterclockwise cam rotation.

(b) If the equations of the displacement and its derivatives of the full-rise simple harmonic motion are

$$y = \frac{L}{2}\left(1 - \cos\frac{\pi\theta}{\beta}\right), \quad y' = \frac{\pi L}{2\beta}\sin\frac{\pi\theta}{\beta}, \quad y'' = \frac{\pi^2 L}{2\beta^2}\cos\frac{\pi\theta}{\beta}, \text{ and } \quad y''' = -\frac{\pi^3 L}{2\beta^3}\sin\frac{\pi\theta}{\beta},$$

and the cam rotates with a constant speed of 120 rpm, determine the maximum velocity of the follower.



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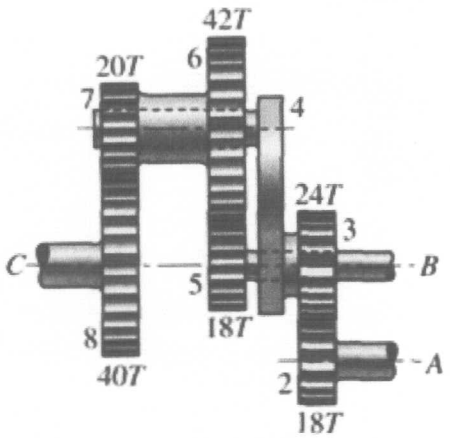
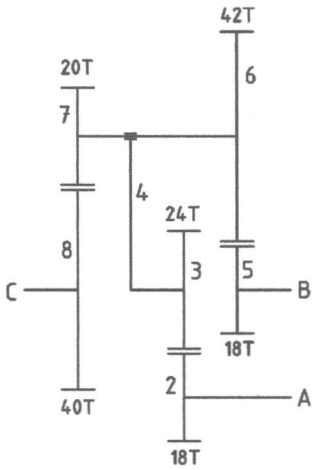
2) The planetary gear set shown has gears 6 and 7 carried by arm 4. Arm 4 is rotating with gear 3 which is connected to gear 2. if shaft A rotates at 360 rev/min clockwise, and shaft B rotates at 360 rev/min counterclockwise , determine (a) the speed and direction of rotation of arm 4 and (b) the speed and direction of rotation of shaft C.





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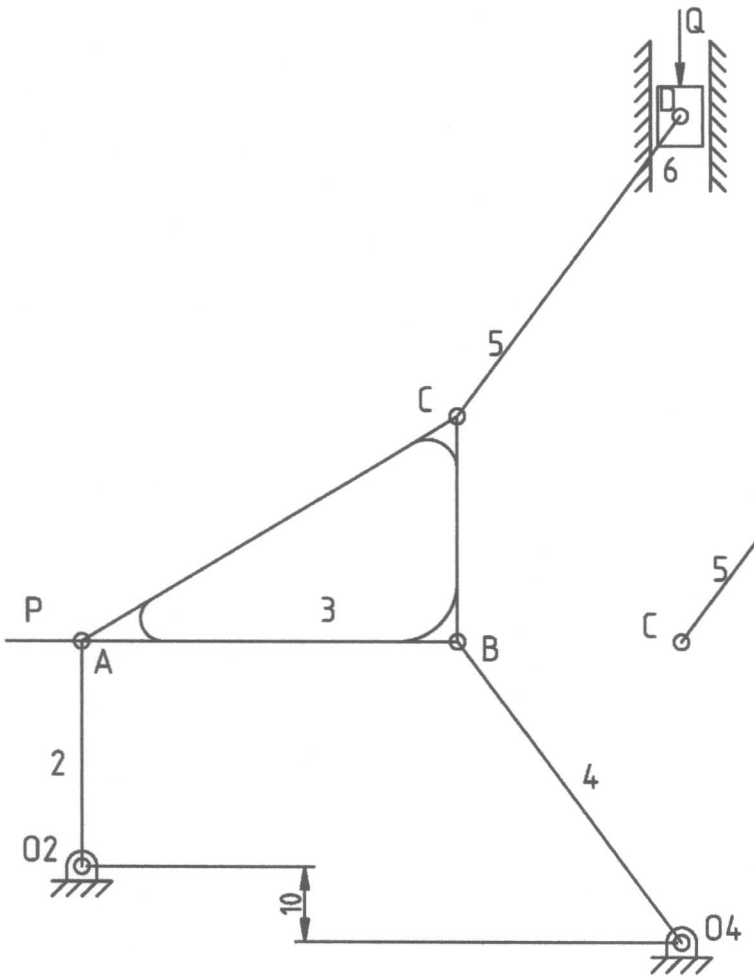
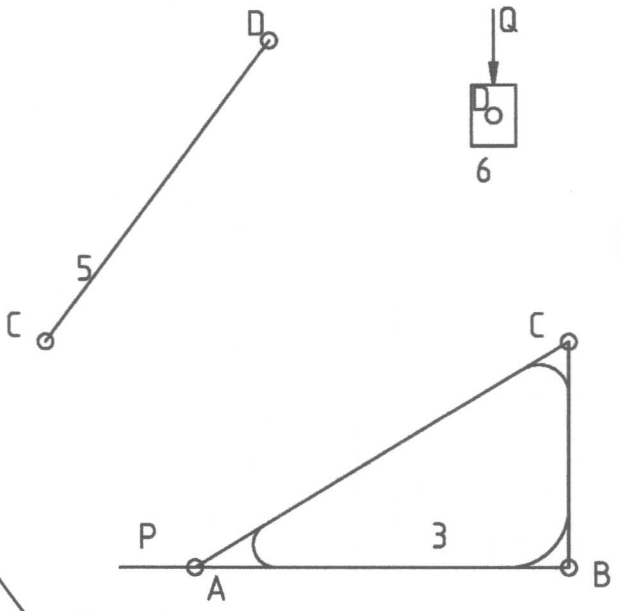
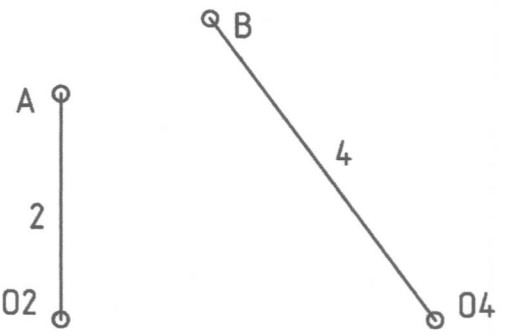
3) For the 6-bar mechanism shown, a force Q = 60 N downward is applied to link 6 as shown. Determine the force P acting horizontally at point A on link 3 as shown, to keep the mechanism in static equilibrium. Also draw the complete free body diagram of links 2 to 6.







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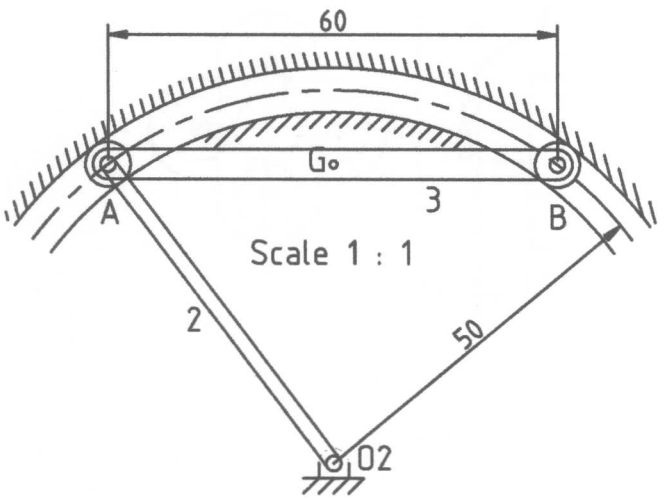
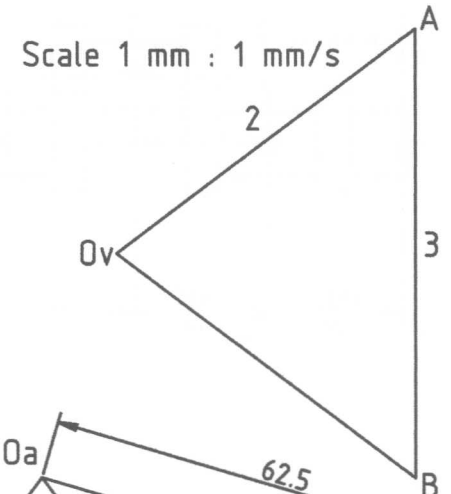
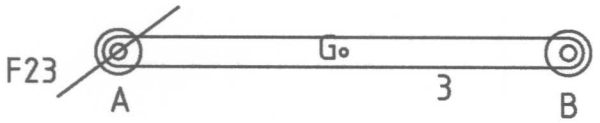
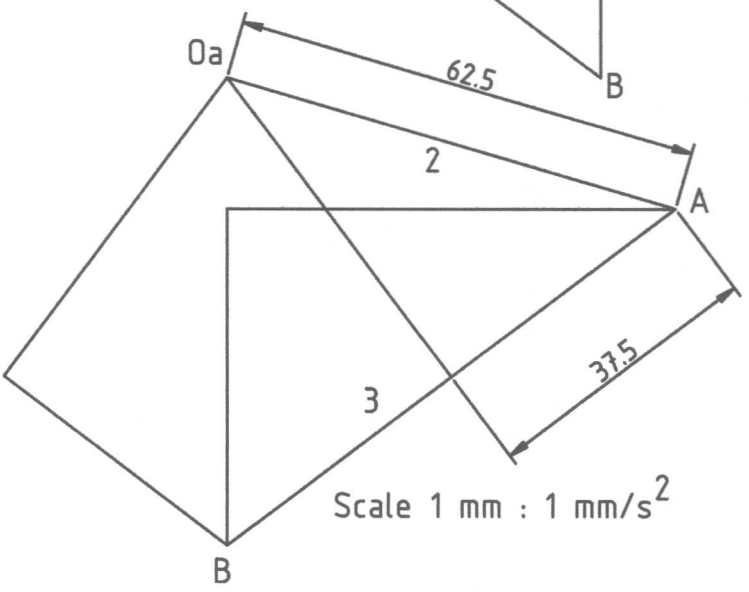
4) For the mechanism shown, link 2 is rotating with ω_2 = 1 rad/s cw, and α_2 = 0.75 rad/s^2 cw. The velocity and acceleration analysis are provided as shown. If link 3 has mass m_3 = 0.8 kg, and mass moment of inertia about its center of gravity (CG), I_{3G} = 64 kg-mm^2. Determine (a) the acceleration of CG of link 3 , a_G , and the angular acceleration of link 3, α_3 , (b) the inertia force and inertia moment of link 3, and (c) the force by link 2 acting on link 3, F_{23}, to cause this motion.









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5) The crank shaft of a 4-cylinder engine has 4 cranks of equal mass 300 g each at the distance 50 mm from the center of shaft rotation as shown. The cranks are 100 mm apart and 90degrees radially from each other. Determine the correction masses at their angular location, if they are to be placed at 50 mm radius in the planes of the two bearings, A and B.