Name : _____ Student ID # : _____

คณะวิศวกรรมศาสตร์
มหาวิทยาลัยสงขลานครินทร์

การสอบปลายภาค ประจำภาคการศึกษาที่ ๒ ประจำปีการศึกษา ๒๕๕๒
วันพุธที่ ๑๗ กุมภาพันธ์ พ.ศ. ๒๕๕๓ เวลา ๑๓.๓๐-๑๖.๓๐ น.
วิชา ๒๑๕-๓๒๔/๒๑๖-๓๒๔ กลศาสตร์เครื่องจักรกล ห้องสอบ Robot / S201

ทุจริตในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต 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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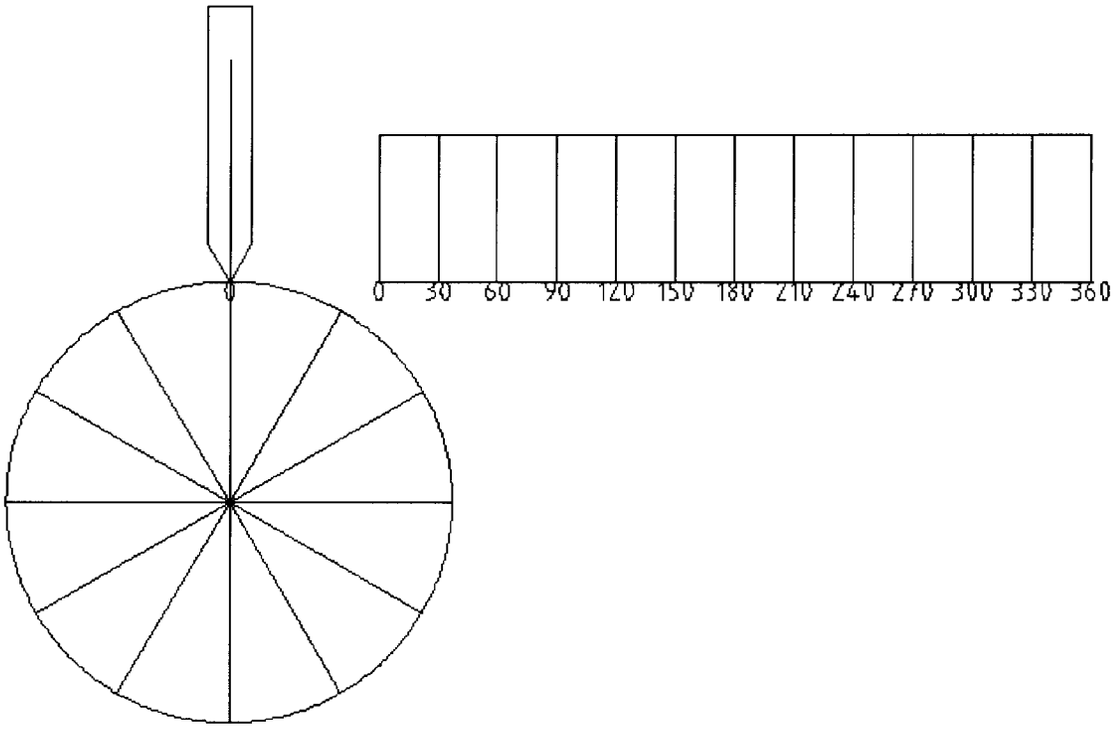
1) (a) The reciprocating radial knife-edge follower of a cam is to rise 2 cm uniformly (constant speed) in 120° of cam rotation, then dwell for 60° , then return uniformly to its starting height in 90° , and finally dwell for the remaining 90°. If the prime circle radius is 3 cm, draw the displacement diagram and sketch the cam profile for clockwise cam rotation.



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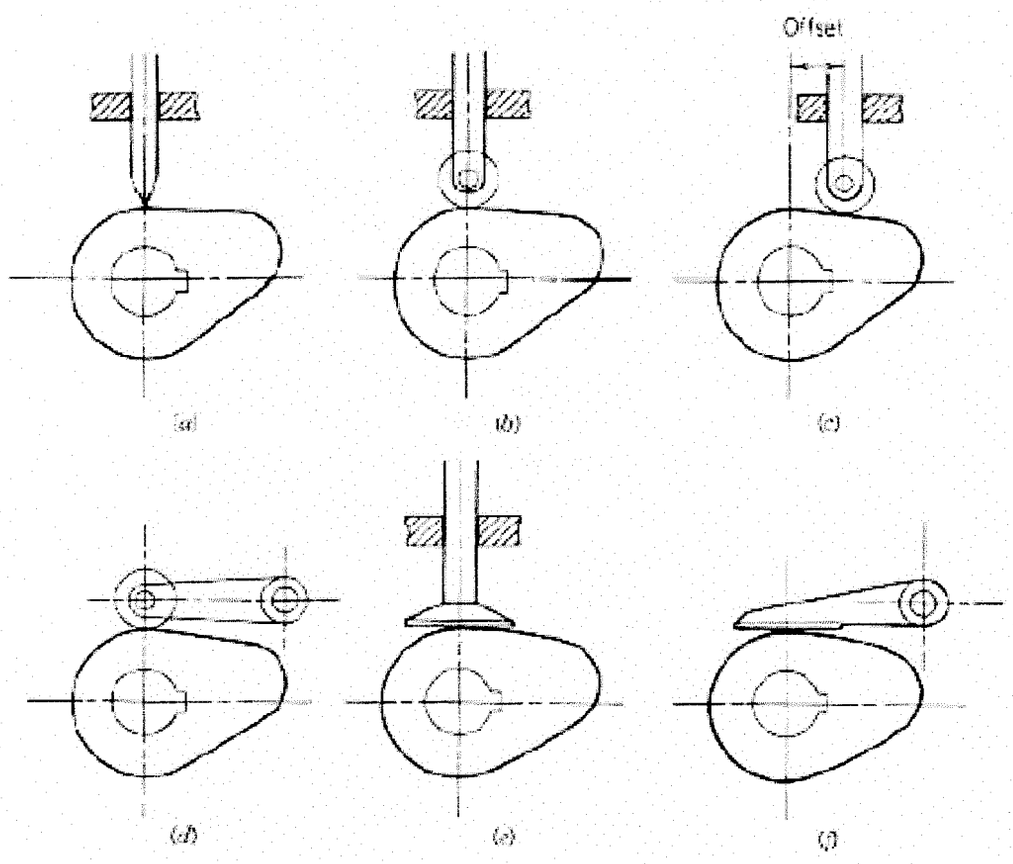
1) (b) Use the figure below to answer these questions



Which cams have flat-faced followers ? _____

Which cams have radial followers ? _____

Which cams have oscillating followers ? _____

Of what type are all these cam ? _____

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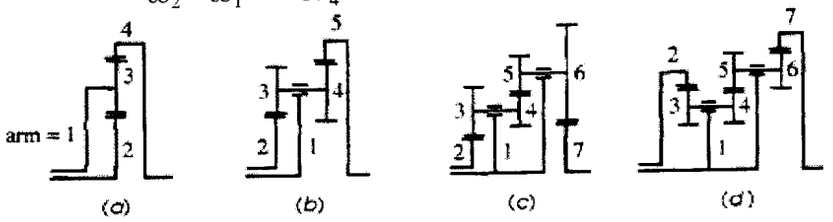
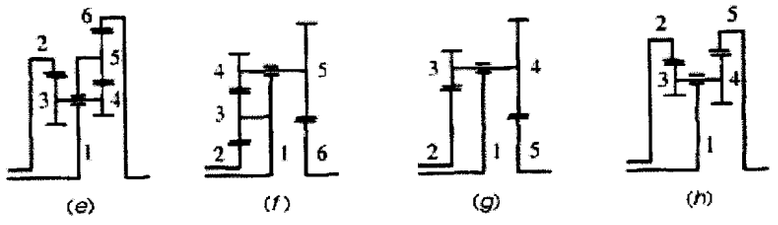
2) (a) If $\frac{\omega_4-\omega_1}{\omega_2-\omega_1}=-\frac{N_2}{N_4}$ is the formula for case (a) , then



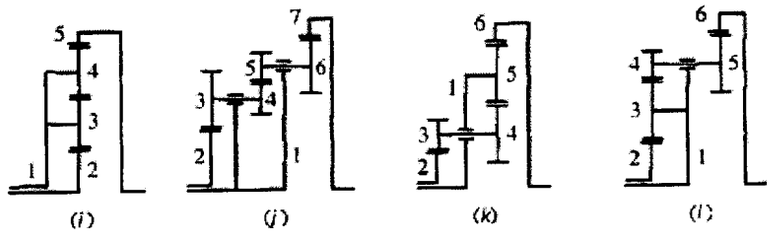
$\frac{\omega_5-\omega_1}{\omega_2-\omega_1}=-\frac{N_2}{N_3}\frac{N_4}{N_5}$

is for case _____ ,



$\frac{\omega_6-\omega_1}{\omega_2-\omega_1}=-\frac{N_2}{N_4}\frac{N_5}{N_6}$

is for case _____ ,

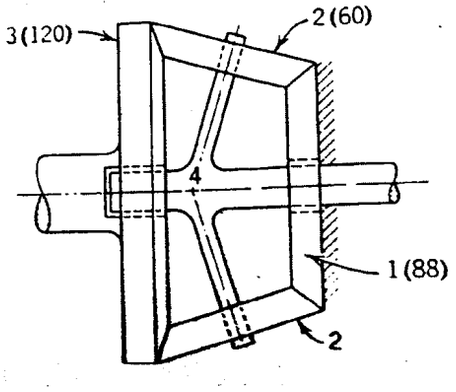


and

$\frac{\omega_7-\omega_1}{\omega_2-\omega_1}=+\frac{N_2}{N_3}\frac{N_4}{N_5}\frac{N_6}{N_7}$

is for case _____ .

(b) A bevel planetary gear train is shown below. Gear 1 is fixed, with the input is gear 3 and the output is arm 4. The data for gear numbers of teeth and input velocities are given as : N_1 = 88, N_2 = 60, N_3 = 120, and ω_3 = 200 clockwise when viewed from the left. Determine the velocity of the arm, ω_4.



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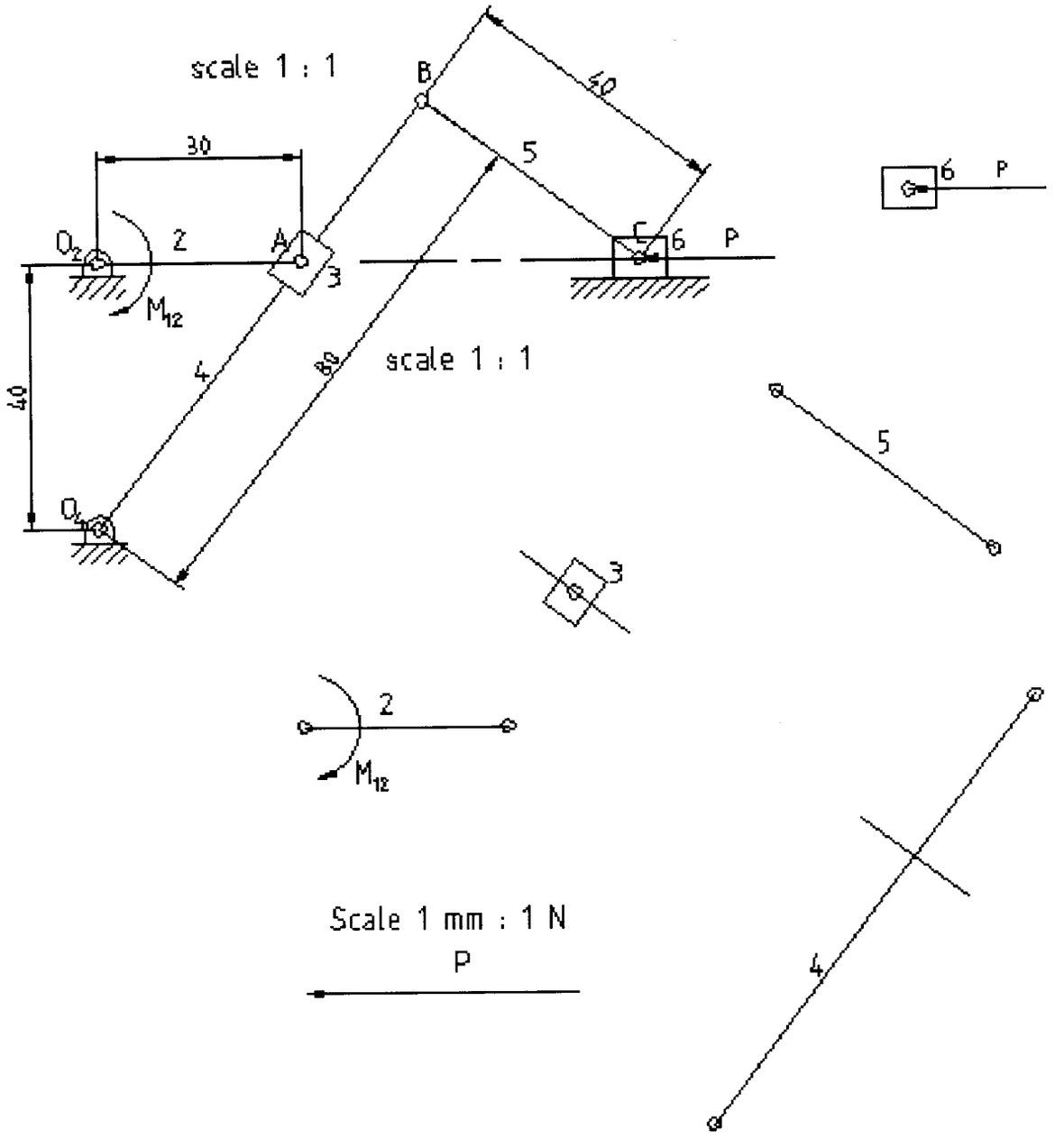
3) For the 6-bar quick-return mechanism shown, force P of 40 N is applied to link 6. Determine the input torque M_{12} to keep the mechanism in static equilibrium.



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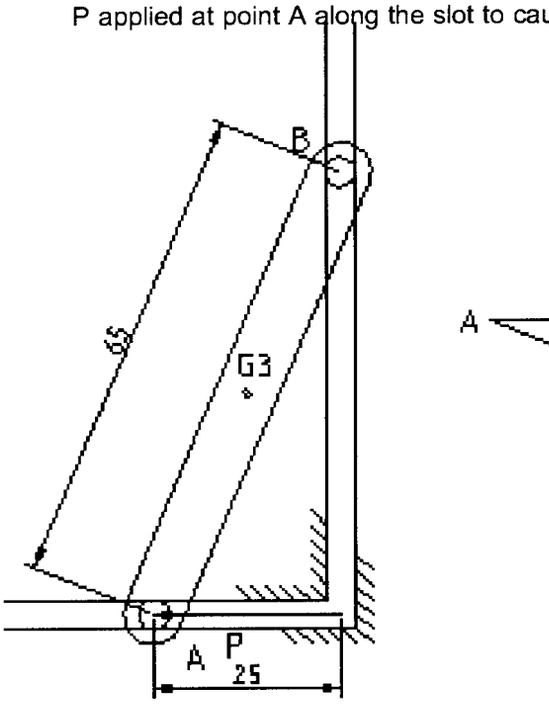
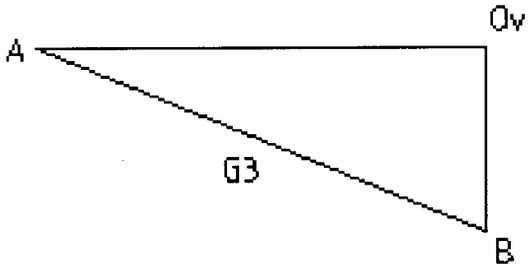
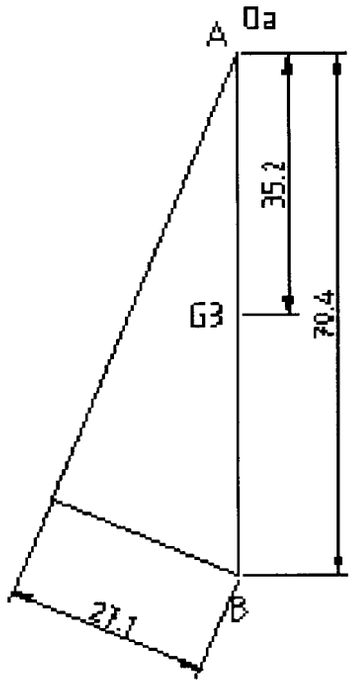
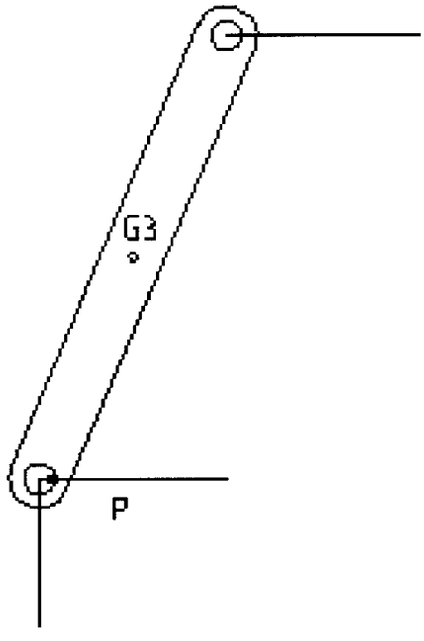
4) Link 3 (AB) of the mechanism shown has its center of mass at G and the following data; m_3 = 1 kg, I_G = 3200 kg-mm^2, R_{AB} = 65 mm, R_{AG} = 32.5 mm. Point A is moving with a constant velocity, v_A = 60 mm/s to the left. It can be determined that the acceleration a_G is 35.2 mm/s^2 downward, with α_3 = 0.417 rad/s^2 clockwise. Assume no friction. Determine (a) the inertia force, (b) the inertia moment, and (c) the force P applied at point A along the slot to cause this motion of link 3.









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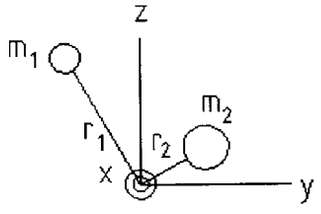
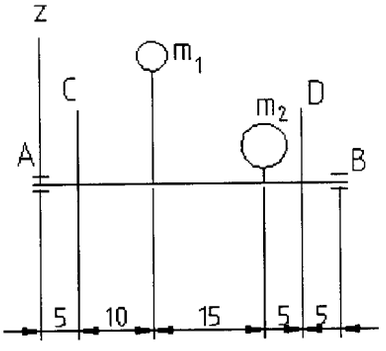
5) A rotor has unbalance masses m_1 = 15 g, at radius r_1 = 0.020 m, and m_2 = 20 g, at radius r_2 = 0.020 m, on a shaft supported at the bearings A and B, as shown. This rotor is rotating at 2000 rpm. Two correction masses of 15 g each are to be placed in the planes C and D to balance this rotor. Determine the angular location and the radius for each mass so that the dynamic load on the bearings will be zero.





m1 = 15 g
r1 = 20 mm

m2 = 20 g
r2 = 10 mm

mc = 15 g
md = 15 g