

II B.Tech II Semester Examinations, April/May 2012**KINEMATICS OF MACHINERY****Common to Mechanical Engineering, Production Engineering, Automobile Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Define dedendum circle, line of action, module, arc of contact pertaining to gears.
(b) A 2.5 module, 20^0 pinion with 40 teeth meshes with a rack with no backlash. If the rack is pulled out 1.25mm, calculate the backlash error. [6+10]
2. (a) Define cam. What are the uses of cam & follower?
(b) Construct the profile of a disc cam with translating flat follower with the following data: Rise 3 cm with harmonic motion in 180^0 of cam rotation, return with parabolic motion in 150^0 of cam rotation and then dwell. The base circle diameter is 15 cm. Determine the width of follower face allowing 0.75 cm clearance. The cam rotates in a counterclockwise direction. Check the possibility for a cusp on the cam. [4+12]
3. (a) What is the difference between quick return motion of crank and slotted lever type and that of Whitworth type?
(b) Find the distance between the fixed centers of a Whitworth quick return motion mechanism if the length of driving link is 40mm, return stroke is 150mm and time ratio of cutting to return stroke is 2. [6+10]
4. (a) What condition must be satisfied by the steering gear of a car in order that the wheels may have a pure rolling motion when rounding a curve? Deduce the relationship between the inclinations of the front stub axles to the rear axle, the distance between the pivot centers for the front axles and the wheelbase of the car.
(b) What is a Hooke's joint? Show that for a Hooke's joint $\tan \theta = \cos \alpha \tan \phi$, where θ and ϕ are the angles turned by the driving and driven shafts at any instant and α is the angle of inclination of driven shaft with driving shaft. [6+10]
5. In a reverted gear train, as shown in figure 5, two shafts A and B are in the same straight line and are geared together through an intermediate parallel shaft C. The gears connecting the shafts A and C have a module of 3mm and those connecting the shafts C and B have a module of 4.5mm. The speed of shaft A is to be 12 times the speed of shaft B. The ratio of each reduction is same. Find suitable number of teeth on all gears. The minimum number of teeth is 18. Also find the exact velocity ratio and the distance of shaft C from A and B. [16]

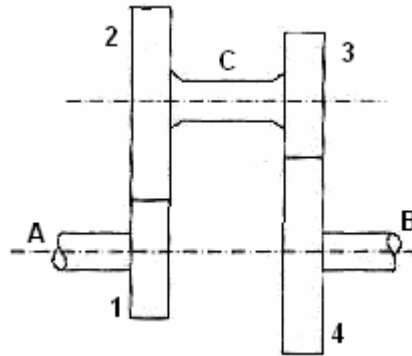


Figure 5

6. A shaper mechanism is shown in Figure 4. The crank OA rotates at uniform speed of 20 rpm clockwise. The guide block A slides along the slotted lever AD that has its fulcrum at 'C'. The connecting rod BD connects the tool head B to AD. The tool head is constrained to move along BC perpendicular to OC. Find the velocity and acceleration of 'B'. OA= 200 mm; OC=400 mm; CD=200 mm; BD=500mm and angle AOC= 120°. [16]

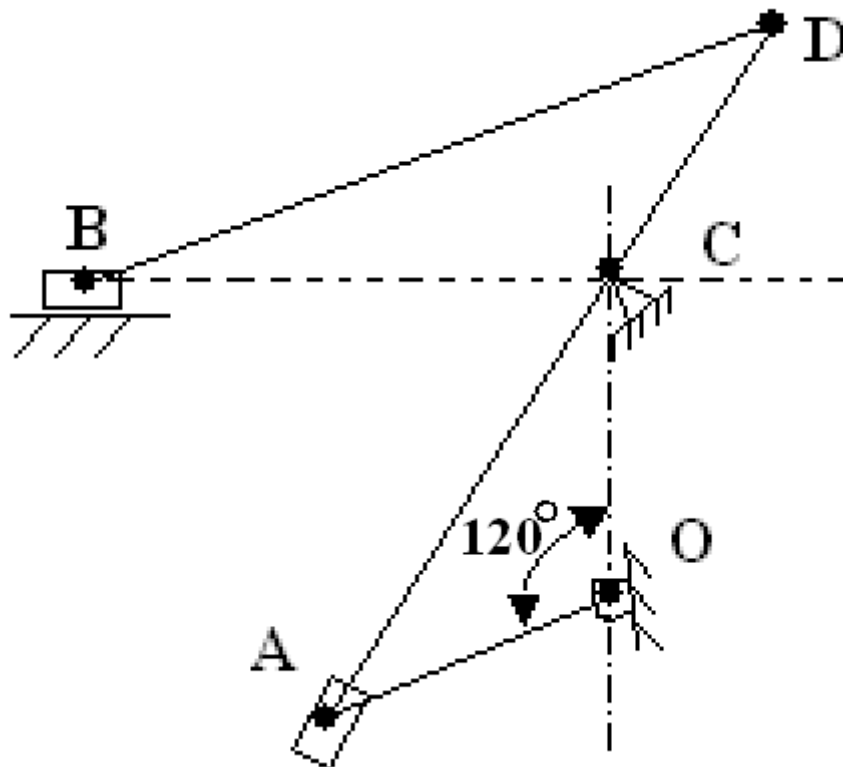


Figure 1:

7. Design a set of stepped pulleys to drive a machine from a countershaft running at 300rpm. It is needed to have the following speeds of the driven shaft: 140rpm, 180rpm and 220rpm. The centre distance between the axes of the two shafts is 5m.

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R07

Set No. 2

The diameter of the smallest pulley is 300mm. The two shafts rotates in the same direction. [16]

8. (a) What is pantograph? What are its uses?
(b) Show that the pantograph can produce paths exactly similar to the ones traced out by a point on a link on an enlarged or a reduced scale. [6+10]

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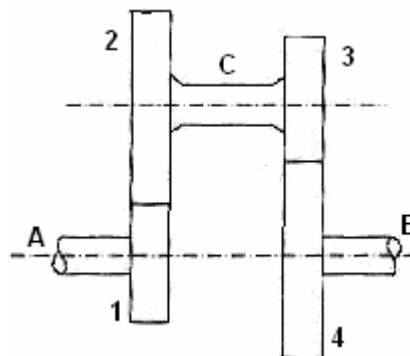


Figure 5

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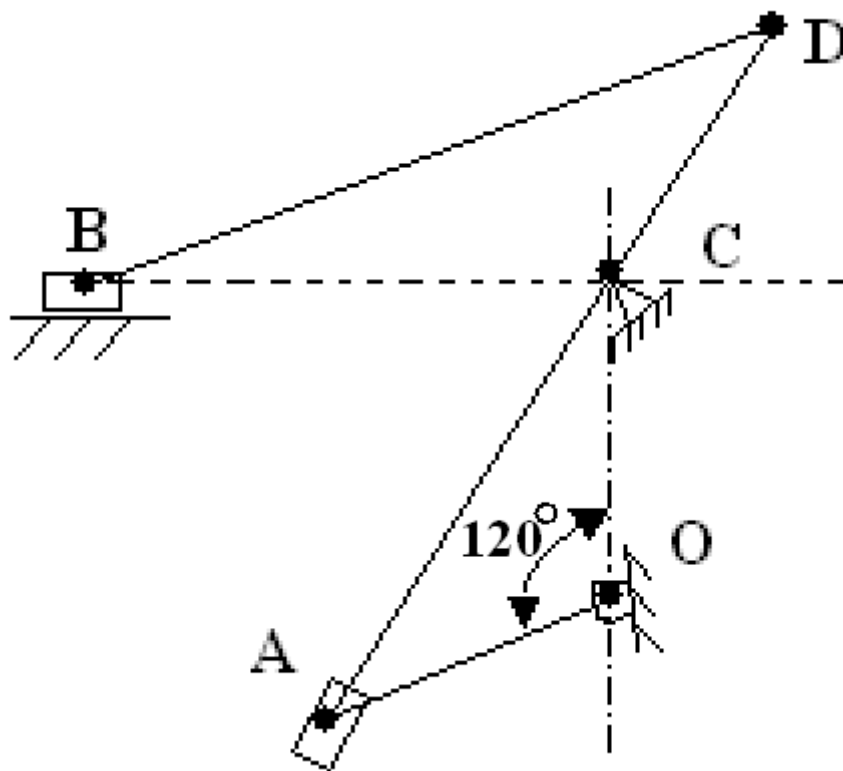


Figure 2:

7. (a) What condition must be satisfied by the steering gear of a car in order that the wheels may have a pure rolling motion when rounding a curve? Deduce the relationship between the inclinations of the front stub axles to the rear axle, the distance between the pivot centers for the front axles and the wheelbase of the car.
- (b) What is a Hooke's joint? Show that for a Hooke's joint $\tan \theta = \cos \alpha \tan \phi$, where θ and ϕ are the angles turned by the driving and driven shafts at any instant and α is the angle of inclination of driven shaft with driving shaft. [6+10]

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R07

Set No. 4

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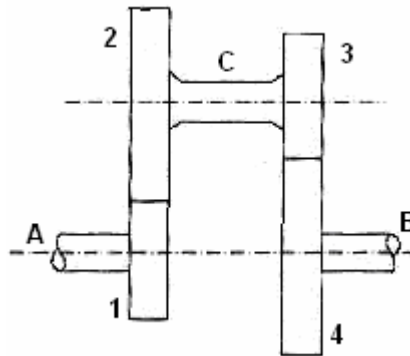


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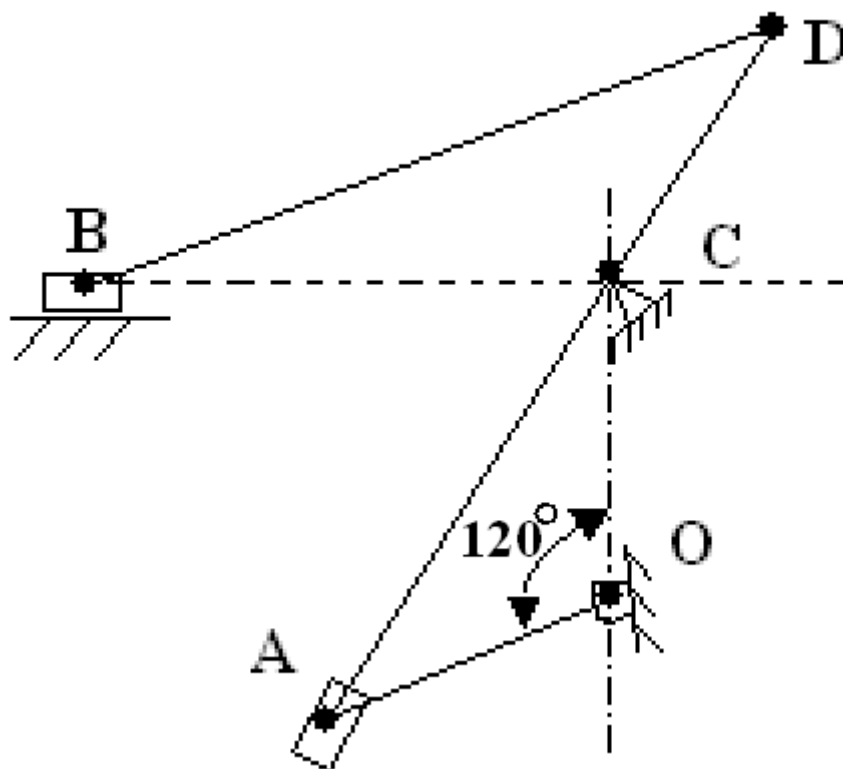


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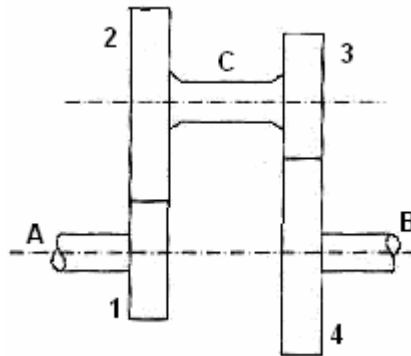


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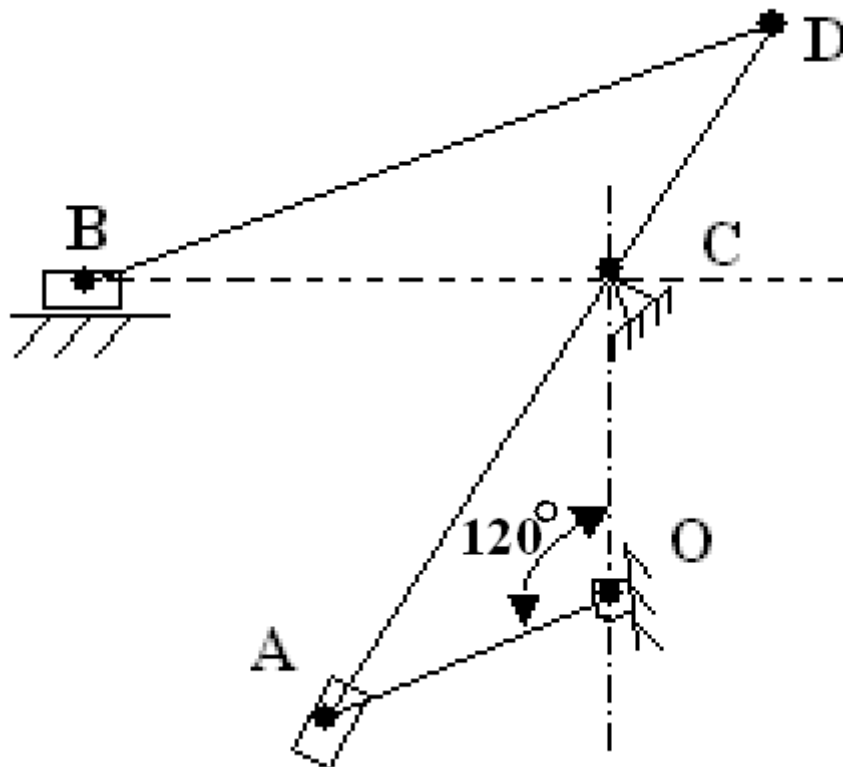


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