Code No: 07A4EC04 **R07** **Set No. 2**

II B.Tech II Semester Examinations,APRIL 2011
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) Derive an expression for displacement, velocity and acceleration of a circular arc cam with flat faced follower when follower is in contact with flank.
   (b) Layout the profile of a cam so that the follower
      i. Is to move outwards through 30mm during 180^0 of cam rotation with cycloidal motion.
      ii. Dwell for 20^0 of the cam rotation.
      iii. Returns with uniform velocity during the remaining 160^0 of the cam rotation.

   The base circle diameter of the cam is 28mm and the roller diameter 8mm. The axis of the follower is offset by 6mm to the left. What will be the maximum velocity and acceleration of the follower during the outstroke if the cam rotates at 1500rpm counter-clockwise? [4+12]

2. (a) Explain about "selection of automotive transmission gear trains".
   (b) Figure 4b shows a port indicator for a twin-screw ship. It is found that the pointer P remains stationary if the propellers run at the same speed and drive the gears C and D in the same direction through equal gears A and B. If the number of teeth on G and F are 24 and 50 respectively, find the ratio of the number of teeth on C to that on D.
   What will be the speed of the pointer if B runs at 5% faster than A and if the speed of C is 100rpm? [4+12]

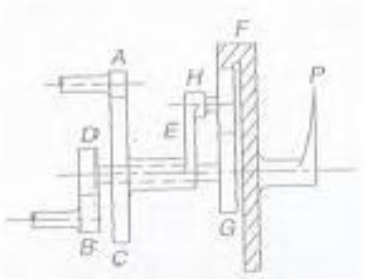

Figure 4b

3. (a) What conditions must be satisfied by the steering mechanism of a car in order that the wheels may have a pure rolling motion when rounding a curve? Deduce the relationship connecting the inclinations of the front stub axles to the rear axle, the distance between the pivot centers for the front axles and wheelbase of the car.

(b) A Hooke's joint connects a shaft running at a uniform speed of 1200 rpm to a second shaft, the angle between their axes being 20 degrees. Find the velocity and acceleration of the driven shaft at the instant when the fork of the driving shaft has turned through an angle of 15^o from the plane containing the shaft axes. At what positions of the driving shaft during a revolution, the angular velocity of the driven shaft is the same as that determined above? [8+8]

4. For the inverted slider-crank mechanism shown in Figure 3, find the angular velocity and angular acceleration of the link BC and the sliding velocity of the block on the link BC .The crank OA is 200 mm long and rotates at 30 rad/s in the clockwise direction. OB is 600 mm and angle BOA = 40^o. [16]

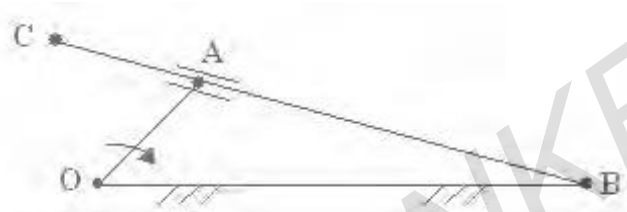

Figure 3

5. (a) Show that for the scotch yoke mechanism shown in figure 7 uniform rotation of the crank 'b' will produce simple harmonic motion of the slider 'd'.

(b) Name the inversion obtained by fixing link 'b' of the scotch yoke mechanism shown in figure 7. Describe the inversion with neat sketch. [8+8]

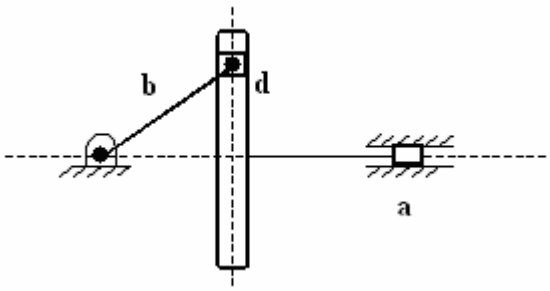

Figure 7

6. (a) What do you mean by undercutting of gears?

(b) A pair of spur gears with involute teeth is to give a gear ratio of 3:1. The arc of approach is not to be less that the circular pitch and the pinion is the driver. The pressure angle is 20^0. What is the least number of teeth that can be used on each gear? [4+12]

7. (a) Explain about types of materials used in belt drive.

(b) A 100mm wide and 10mm thick belt transmits 5kW between the shaft centres 1.5m and the diameter of the smaller pulley is 440mm. The driving and the driven shafts rotate at 60 rpm and 150rpm respectively. Find the stress in the belt if the two pulleys are connected by:

i. An open belt, and

ii. A cross belt. The coefficient of friction is 0.22. [4+12]

8. In figure 6 shown, the dimensions of the various links are such that $\frac{OA}{OB} = \frac{OE}{OF} = \frac{AC}{BD} = \frac{EC}{FD}$. Show that if C traces any path, then D will describe a similar path and vice-versa. [16]

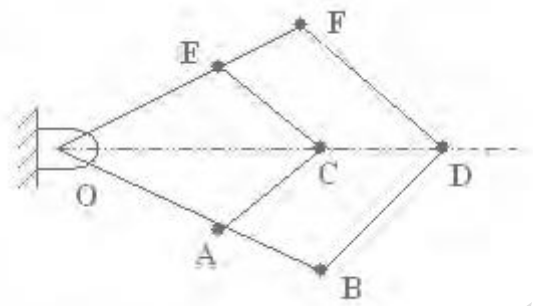

Figure 6

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Code No: 07A4EC04 **R07** **Set No. 4**

II B.Tech II Semester Examinations,APRIL 2011
KINEMATICS OF MACHINERY
Common to Mechanical Engineering, Production Engineering, Automobile Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) Show that for the scotch yoke mechanism shown in figure 7 uniform rotation of the crank 'b' will produce simple harmonic motion of the slider 'd'.
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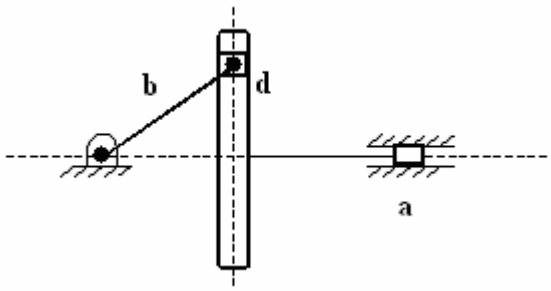

Figure 7

2. (a) What do you mean by undercutting of gears?
   (b) A pair of spur gears with involute teeth is to give a gear ratio of 3:1. The arc of approach is not to be less that the circular pitch and the pinion is the driver. The pressure angle is 20^0. What is the least number of teeth that can be used on each gear? [4+12]

3. For the inverted slider-crank mechanism shown in Figure 3, find the angular velocity and angular acceleration of the link BC and the sliding velocity of the block on the link BC .The crank OA is 200 mm long and rotates at 30 rad/s in the clockwise direction. OB is 600 mm and angle BOA = 40^o. [16]

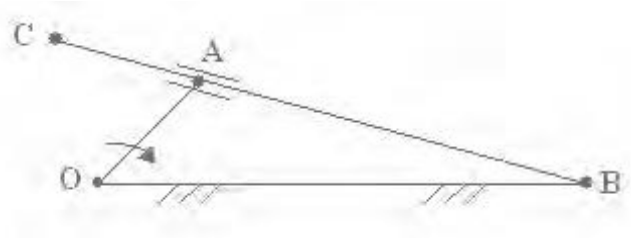

Figure 3

4. (a) Explain about types of materials used in belt drive.
   (b) A 100mm wide and 10mm thick belt transmits 5kW between the shaft centres 1.5m and the diameter of the smaller pulley is 440mm. The driving and the

driven shafts rotate at 60 rpm and 150rpm respectively. Find the stress in the belt if the two pulleys are connected by:

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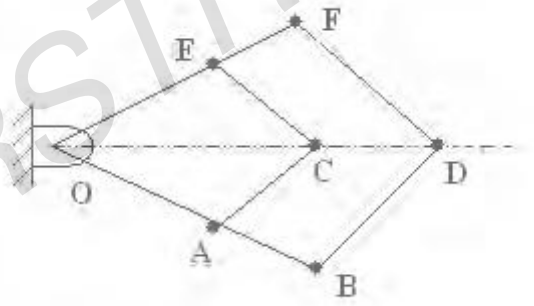

Figure 6

7. (a) Explain about "selection of automotive transmission gear trains".

   (b) Figure 4b shows a port indicator for a twin-screw ship. It is found that the pointer P remains stationary if the propellers run at the same speed and drive the gears C and D in the same direction through equal gears A and B. If the number of teeth on G and F are 24 and 50 respectively, find the ratio of the number of teeth on C to that on D.
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Code No: 07A4EC04 **R07** **Set No. 4**

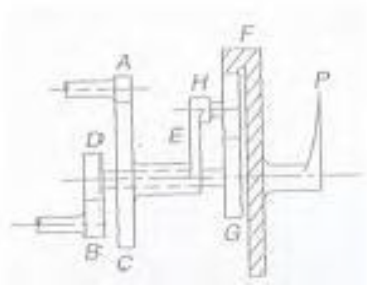

Figure 4b

8. (a) Derive an expression for displacement, velocity and acceleration of a circular arc cam with flat faced follower when follower is in contact with flank.

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Code No: 07A4EC04 **R07** **Set No. 1**

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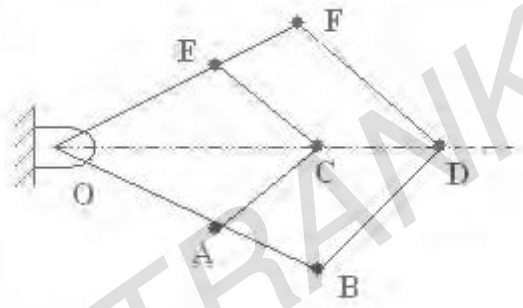

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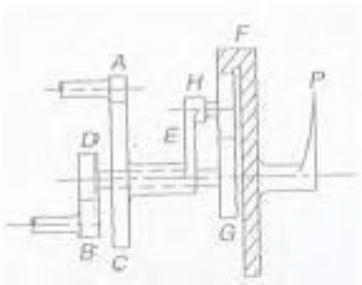

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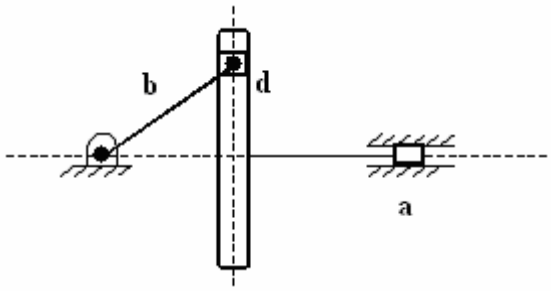
Code No: 07A4EC04 **R07** **Set No. 1**



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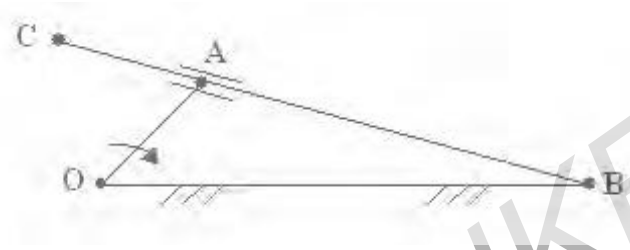

Figure 3

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Code No: 07A4EC04 **R07** **Set No. 3**

II B.Tech II Semester Examinations,APRIL 2011
KINEMATICS OF MACHINERY
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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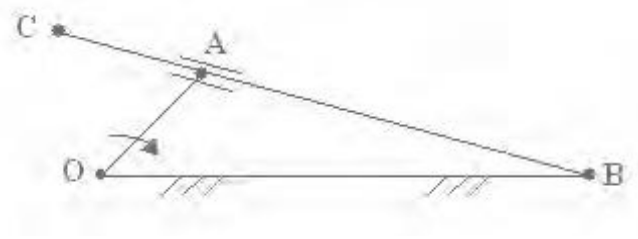

Figure 3

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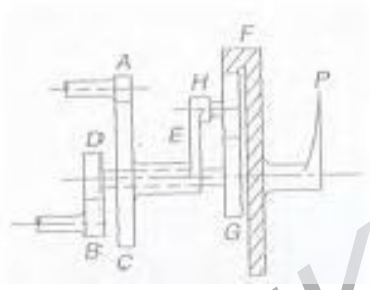

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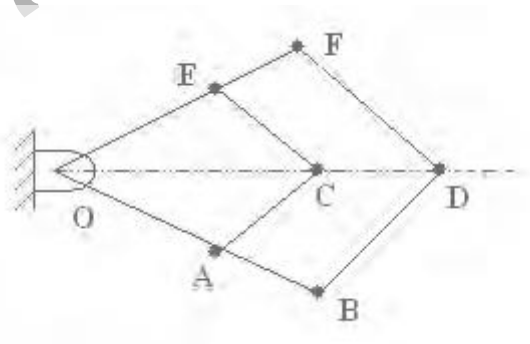

Figure 6

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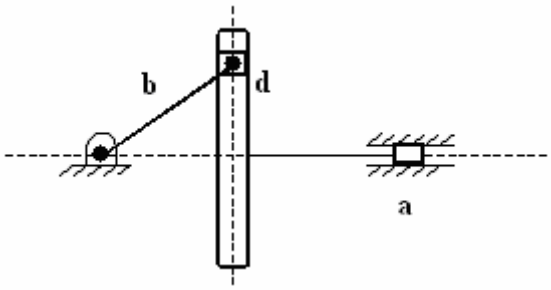

Figure 7

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