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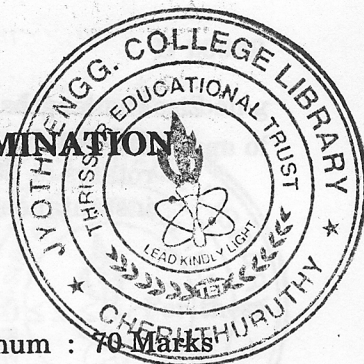
**FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
OCTOBER 2011**

ME/PTME/AM 09 505—MECHANICS OF MACHINERY

(2009 Admissions)

Time : Three Hours

Maximum : 70 Marks



Part A

Answer all questions.

1. What you mean by degree of freedom of a mechanism ?
2. Define and explain the terms : cam profile, base circle, prime circle, pitch curve, lift and period of dwell.
3. What is significance of contact ratio in gear drive ?
4. List the advantages offered by epicyclic gear-train compared to simple and compound gear train.
5. What do you mean by kinematic synthesis ? Explain three stages in which kinematic synthesis is accomplished.

(5 × 2 = 10 marks)

Part B

Answer any four questions.

1. Explain the concept of relative velocity method and write the procedure to draw velocity polygon of a slider mechanism.
2. What you mean by Coriolis acceleration ? Show that Coriolis acceleration is $2\omega v$.
3. Explain why a roller follower is preferred to a knife edge follower.
4. Describe various types of cams and follower commonly used. Write their relative merits and demerits.
5. With the help of neat sketch, show the path of contact and arc of contact for two cycloidal gears in mesh.
6. Explain the graphical procedure to synthesize four bar mechanism by (a) two position synthesis (b) three position synthesis methods.

(4 × 5 = 20 marks)

Part C

1. For the straight line mechanism shown in Figure 1 $\omega_2 = 20$ rad/sec clockwise and $\alpha_2 = 140$ rad/sec² clock wise. Determine the velocity and acceleration of point 'B' and angular acceleration of link 3. $AO_2 = CA = BA = 100$ mm.

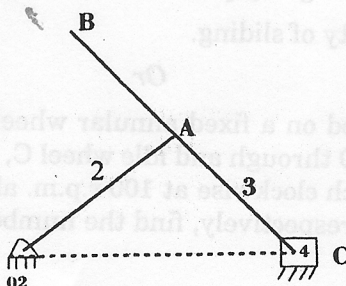


Fig.1

Or

Turn over

2. The lengths of various links of a mechanism as shown in Figure 2 are ; $OA = 0.3 \text{ m}$; $AB = 1 \text{ m}$; $CD = 0.8 \text{ m}$; and $AC = CB$. Determine for the configuration, velocity of slider D if the crank OA rotates at 60 r.p.m. in the clockwise direction. Also find the angular velocity of the link CD. Use instantaneous centre method.

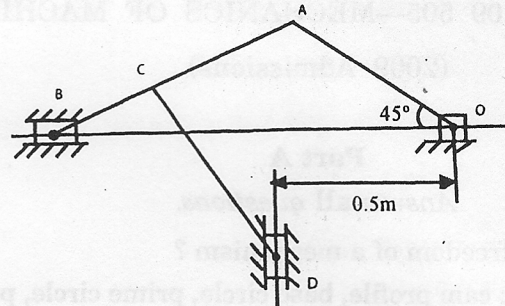


Fig.2

3. Draw the profile of a cam operating a roller follower when the axis of the follower offset 20 mm from the axis of the cam shaft from the following data :
- Follower to move outward through 45 mm during 80° of cam rotation.
 - Follower to dwell for next 45° .
 - Follower to return to its original position during next 120° .
 - Follower to dwell for the rest of the cam rotation.

The displacement of the follower is to take place with simple harmonic motion during both the outward stroke and return stroke.

Or

4. The following data is related to a symmetrical circular arc cam operating a flat faced follower :
- Least radius of cam of the cam = 27.5 mm ; total lift = 12.5 mm ; angle of lift = 55° ; nose radius = 3 mm ; speed of cam = 600 r.p.m. Find :
- Distance between cam centre and nose centres.
 - Radius of circular flank, and
 - Angle of contact on the circular flank.
5. Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 6 mm and the pitch line speed is 1.2 m/s, assumed addendum as standard and equal to one module find :
- The angle turned through by pinion when one pair of teeth is in mesh.
 - The maximum velocity of sliding.

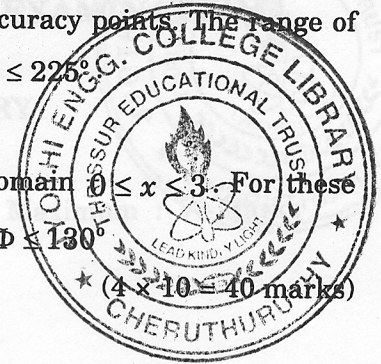
Or

6. An epicyclic train is composed on a fixed annular wheel having 150 teeth. Meshing with A is a wheel B which drives wheel D through and idle wheel C, D being concentric with A. Wheels B and C are carried on an arm which clockwise at 100 r.p.m. about the axis of A and D. If the wheels B and D have 25 and 40 teeth respectively, find the number of teeth on C and the speed and sense of rotation of C.

7. Determine the lengths of all the four links in a four bar chain for the length of the smallest being 10 cm to generate $y = \log_{10} x$ in the interval $1 \leq x \leq 10$ for three accuracy points. The range of angles of input link and output link are $45^\circ \leq \theta \leq 105^\circ$ and $135^\circ \leq \Phi \leq 225^\circ$.

Or

8. Determine the Chebychev spacing for function $y = x + 3x^2$ for the domain $0 \leq x \leq 3$. For these points determine $\theta_1, \theta_2, \theta_3$, and Φ_1, Φ_2, Φ_3 if $20^\circ \leq \theta \leq 80^\circ$ and $30^\circ \leq \Phi \leq 130^\circ$. (4 × 10 = 40 marks)



(5 × 2 = 10 marks)

Part B

Answer any four questions.

1. Explain the concept of relative velocity method and write the procedure to draw velocity polygon of a slider mechanism.
2. What you mean by Coriolis acceleration? Show that Coriolis acceleration is $2\omega \times v$.
3. Explain why a roller follower is preferred to a knife edge follower.
4. Describe various types of cams and follower commonly used. Write their relative merits and demerits.
5. With the help of neat sketch, show the path of contact and arc of contact for two cycloidal gears in mesh.
6. Explain the graphical procedure to synthesize four bar mechanism by (a) two position synthesis (b) three position synthesis methods.

(4 × 5 = 20 marks)

Part C

1. For the straight line mechanism shown in Figure 1, $\omega_1 = 20$ rad/sec clockwise and $\alpha_1 = 140$ rad/sec² clockwise. Determine the velocity and acceleration of point 'W' and angular acceleration of link 5. $AO_2 = CA = BA = 100$ mm.

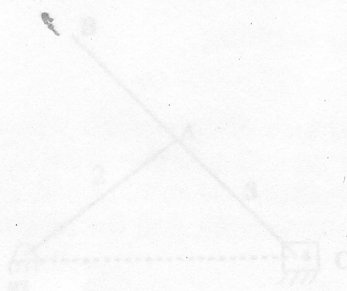


Fig.1

Or

Turn over