B.E. / B.Tech. (Mechanical Engineering) Model Curriculum Semester-V

PCCME304 - Kinematics of Machines

P. Pages : 3 **GUG/W/24/14071**

Time : Three Hours * 5 5 8 8 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.
4. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.
5. Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10.
6. Due credit will be given to neatness and adequate dimensions.

1. a) Classify the kinematic pairs depending upon the number of restraints imposed on the relative motion of the two links connected together. **8**

b) What do you understand by degree of freedom of planer mechanism? Explain the Gruebler's criterion for degrees of freedom of plane mechanism. **8**

OR

2. a) Explain all the inversions of double slider crank mechanisms with neat sketches. **8**

b) Define the following terms **8**
i) Kinematic link
ii) Kinematic pair
iii) Kinematic chain
iv) Degree of freedom

3. a) What are the centripetal and tangential components of acceleration? How are they determined? **4**

b) For the configuration of a slider-crank mechanism as shown in Figure 3a calculate the **12**
i) Acceleration of slider at B.
ii) Acceleration of the point E
iii) Angular acceleration of the link AB. The link OA rotates at 20 rad/sec counter-clockwise.

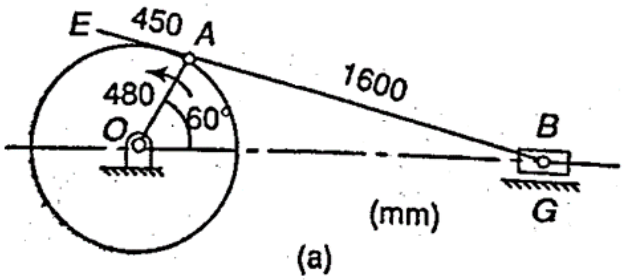

Fig. 3a

4. a) Figure 4a shows a six-link mechanism. The dimensions of the links are OA = 100 mm, AD = 450 mm, BD = 200 mm, QB = 400, DE = 200 mm and CE = 200 mm. Find the angular velocity of the link CE by the instantaneous centre method if the link OA rotates at 20 rad/s. **12**

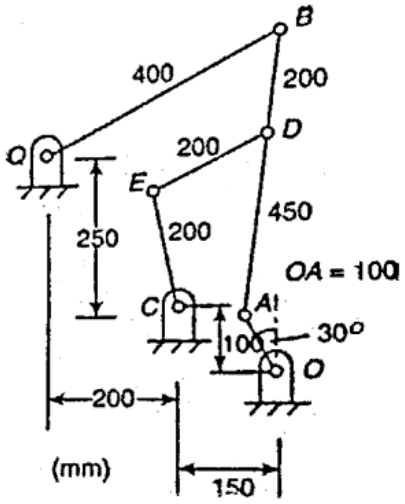

Fig. 4a

b) What is Instantaneous centre of rotation? How do you know the number of instantaneous centes in a mechanism? **4**

5. The following data relate to a cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent. **16**

Minimum radius of cam = 25 mm
Roller diameter = 7.5 mm
Lift = 28 mm
Offset of follower axis = 12 mm towards right
Angle of ascent = 60º
Angle of descent = 90º
Angle of dwell between ascent and descent = 45°
Speed of the cam = 200 rpm
Draw the cam profile and determine the maximum velocity and the uniform acceleration of the follower during the outstroke and the return stroke.

OR

6. a) Explain with neat diagram circular arc (convex) cam with flat-faced follower. **4**

b) The following data relate to a symmetrical circular cam operation a flat-faced follower; **12**
Minimum radius of the cam = 40 mm, Lift = 24 mm, Angle of lift = 75º, Nose radius = 8 mm, Speed of the cam = 420 rpm. Determine the main dimensions of the cam and acceleration of the follower at the

i) Beginning of the lift
ii) End of contact with the circular flank
iii) Beginning of contact with nose
iv) Apex of nose

7. a) Explain law of gearing in detail with neat sketch. **8**

b) Define the following terms in contest to gears. **8**

i) Line of centers
ii) Pitch surface
iii) Pitch diameter
iv) Module

OR

8. a) What is meant by interference in involute gears? Explain. **6**

b) Two gears in a mesh have module of 8 mm and pressure angle of 20º. The larger gear has 57 teeth's whereas the pinion has 23 teeth's. If addendum of the pinion and the gear are equal to 1 module find **10**

i) Number of pairs of teeth's in contact/contact ratio
ii) Angle of action of the pinion and gear wheel
iii) Ratio of the sliding to the rolling velocity at the
    a) Beginning of contact
    b) Pitch point
    c) End of the contact

9. a) a) Explain the working of Disc clutch (Single plate clutch) with neat diagram. **8**

b) What is Friction? Explain Rolling friction, film friction and Greasy friction. **8**

OR

10. a) Explain the following **8**

i) Idler pulley's
ii) Intermediate pulley's
iii) Loose and fast pulley's
iv) Guide pulley's

b) Explain what chain drive is. What are different types of chains? What are advantages and disadvantages of chain drives? **8**

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