B.E. Mechanical Engineering (Model Curriculum) Semester-V
PCCME304 - Kinematics of Machines

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Notes : 1. Attempt 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.
2. All questions carry marks as indicated.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. 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. Non Programmable Electronic Calculator is allowed.

1. a) What is Inversion of mechanism? Explain the quick return mechanism in details with neat sketch. **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) What is Constrained motion? Explain the types of constrained motion with neat example of each type. **8**

b) Define the following terms. **8**
   i) Resistant bodies.   ii) Ternary joint
   iii) Kinematic pair   iv) Degree of freedom.

3. In the mechanism shown in figure 3a the crank OA rotates at 210 rpm clockwise, for the given configuration, determine the velocities and accelerations of the sliders b, D and F. **16**

AB = 80 (mm)
BC = 30
CE = 70
CD = 55

Fig. 3a
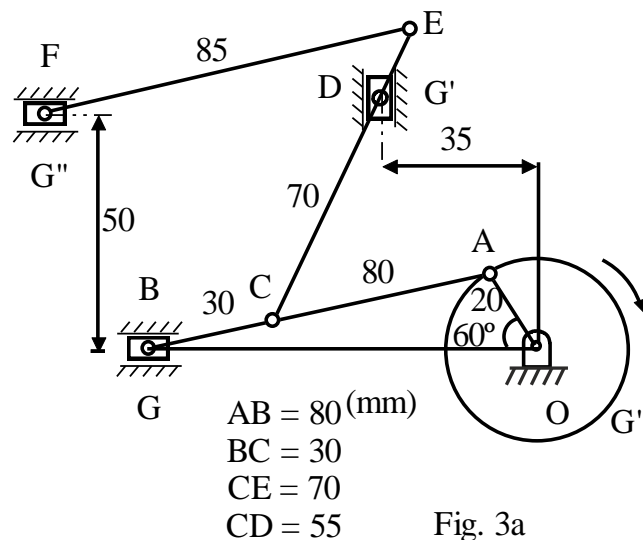
OR

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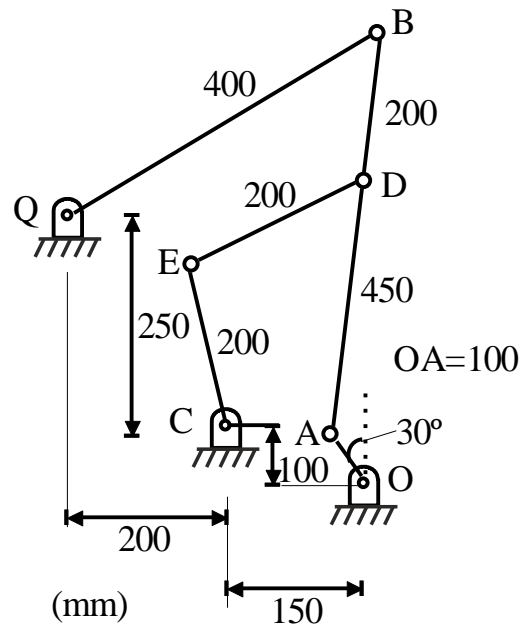rotates at 20 rad/s.

Fig. 4a

b) State and prove Kennedy's theorem as applicable to instantaneous centers of rotation of **4**
three bodies.

5. a) What is displacement diagram? Why is it necessary to draw it before drawing a cam profile? **4**

b) The following data relate to a cam operating an oscillating roller follower. Minimum radius **12**
of cam = 44mm, Roller diameter = 14mm, Length of follower arm = 40mm, Distance of
fulcrum centre from cam centre = 50mm, Angle of ascent = 75°, Angle of descent = 105°,
Angle of dwell for follower in the highest position = 60°, Angle of oscillation of
follower = 28°. Draw the profile of the cam if the ascent and descent both tank place with
SHM.

OR

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

b) A tangent cam with a base circle diameter of 50mm operates a roller follower 20mm in **12**
diameter. The line of stroke of the roller follower passes through the axis of the cam. The
angle between the tangential faces of the cam is 60°, speed of the cam shaft is 200 rpm and
the lift of the follower is 15mm. Calculate the
   i) Main dimension of the cam
   ii) Acceleration of follower at the beginning of lift, where the roller just touches the
   nose and at the apex of the circular nose.

7. a) What types of gears are used for parallel, intersecting and skew shafts? Explain with neat **6**
sketch for each type.

b)   Define the following terms of gears.   **10**
   i)   Pitch circle.
   ii)   Circular Pitch.
   iii) Pitch Diameter
   iv) Pitch point
   v)   Module

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OR

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

     b)   Two 20º involute spur gears mesh externally and give a velocity ratio of 3. The module is   **10**
3mm and the addendum is equal to 1.1 module. If the pinion rotates at 120rpm, determine
the
   i)   Minimum number of teeth on each wheel to avoid interference
   ii)   Contact ratio

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

     b)   Write a short note on antifriction bearings.   **4**

     c)   A body is to be moved up an inclined plane by applying a force parallel to the plane surface.   **4**
It is found that a force of 3kN is required to just move it up the plane when the angle of
inclination is 10º whereas the force needed increases to 4kN when the angle of inclination
is increased to 15º. Determine the weight of the body and the coefficient of friction.

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OR

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10. a)   What are the different modes of transmitting power from one shaft to another? Compare   **6**
them.

     b)   What do you mean by crowning of pulleys in flat-belt drives? What is its use?   **6**

     c)   What is open belt drive and crossed belt drive? Explain the concept of action of belts on   **4**
pulleys with neat sketch.

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