B.E. / B.Tech. Mechanical Engineering (Model Curriculum) Semester-V
PCCME304 / KINEMATICS1 - Kinematics of Machines

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

1.   a)   What is motion? Discuss the various types of constrained motions in detail with neat sketches.   **8**

    b)   Explain the working of Whitworth quick return mechanism with neat sketch.   **8**

OR

2.   a)   Explain the first and second inversions of double slider crank chain with suitable examples.   **8**

    b)   Define Grashof's law. State how is it helpful in classifying the four link mechanism in to different types.   **8**

3.   Figure 3a shows the link mechanism of a quick-return mechanism of the slotted-lever type, the various dimensions of which are OA 400 mm, OP 200 mm, AR = 700 mm, RS = 300 mm. For the configuration shown, determine the acceleration of the cutting tool at S and the angular acceleration of link RS. The crank OP rotates at 210 rpm.   **16**
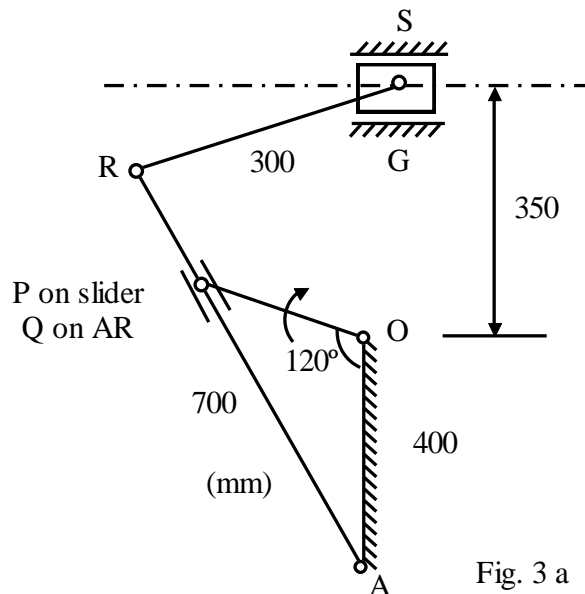

Fig. 3 a

OR

4. Figure 4a shows a six-link mechanism. The dimensions of the links are OA-100 mm, AB-580 mm, BC300 mm, QC-100 mm and CD-350 mm. The crank OA rotates clockwise at 150 rpm. For the position when the crank OA makes an angle of 30° with the horizontal, determine using I-centre method the **16**
i) linear velocities of the pivot points B, C and D
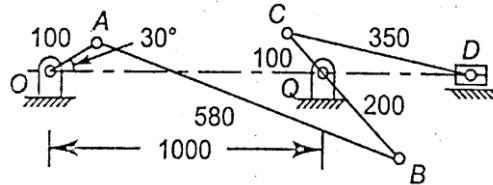ii) angular velocities of the links AB, BC and CD

Fig. 4 a

5. a) What is follower? Explain the different types of followers in detail with neat sketches? **6**

b) A tangent cam with straight working faces tangential to a base circle of 120 mm diameter has a roller follower of 48 mm diameter. The line of stroke of the roller follower passes through the axis of the cam. The nose circle radius of the cam is 12 mm and the angle between the tangential faces of the cam is 90°. If the speed of the cam is 180 rpm, determine the acceleration of the follower when, **10**
i) during the lift, the roller just leaves the straight flank
ii) the roller is at the outer end of its lift, ie, at the top of nose.

OR

6. A cam with a minimum radius of 25 mm is to be designed for a knife-edge follower with the following data; **16**
To raise the follower through 35 mm during 60° rotation of the cam Dwell for next 40° of the cam rotation Descending of the follower during the next 90° of the cam rotation Dwell during the rest of the cam rotation
Draw the profile of the cam if the ascending and descending of the cam is with simple harmonic motion and the line of stroke of the follower is offset 10 mm from the axis of the cam shaft.
What is the maximum velocity and acceleration of the follower during the ascent and the descent if the cam is rotates at 150 rpm?

7. a) Explain the classification of gears in detail with neat sketch. **10**

b) Define the following terms of gears with neat sketch **6**
i)   Gear Ratio   ii)   Module   ii)   Pitch Point

OR

8. a) Cycloidal gears generates vibration in the system, is it true? Justify. **6**

b) Compare the cycloidal and the involute tooth profile. **6**

c) Each of two gears in a mesh has 48 teeth and a module of 8 mm. The teeth are of 20° involute profiles. The arc of contact is 2.25 times the circular pitch. Determine the addendum. **4**

9. a) What is friction? Is it a blessing or curse? Justify your answer giving examples. **8**

b) Explain the term **8**
i)   Coefficient of friction   ii)   Limiting angle of friction
iii) Friction couple   iv)   Friction axis.

OR

10. a) Explain the working of multi-plate clutch with nest diagram. **8**

b) Explain any four type's pulleys with neat sketches in detail. **8**

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