

B.E. Mechanical Engineering (Model Curriculum) Semester - V
PCC-ME304 - Kinematics of Machines

P. Pages : 3

Time : Three Hours



GUG/S/23/14071

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.
 5. Use of Non programmable calculator is permitted.
 6. Solve Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8, Q. 9 or 10

1. a) Draw a neat sketch of quick return mechanism and explain its working in detail. **6**
b) Define Grashof's law. State how is it helpful in classifying the four-link mechanisms into different types. **5**
c) Explain the Transmission Angle. Why transmission angle is kept more than 45° , explain it with suitable example. **5**

OR

2. a) Define 'Inversion of a mechanism'. Explain all the inversions of single slider crank chain with suitable examples. **10**
b) What is degree of freedom of mechanisms? Explain Gruebler's Criterion for degrees of freedom of plane mechanisms. **6**
3. a) Figure 3.1 shows a mechanism in which O and Q are the fixed centers. Determine the acceleration of the slider S and the angular acceleration of the link BQ for the given configuration. **12**

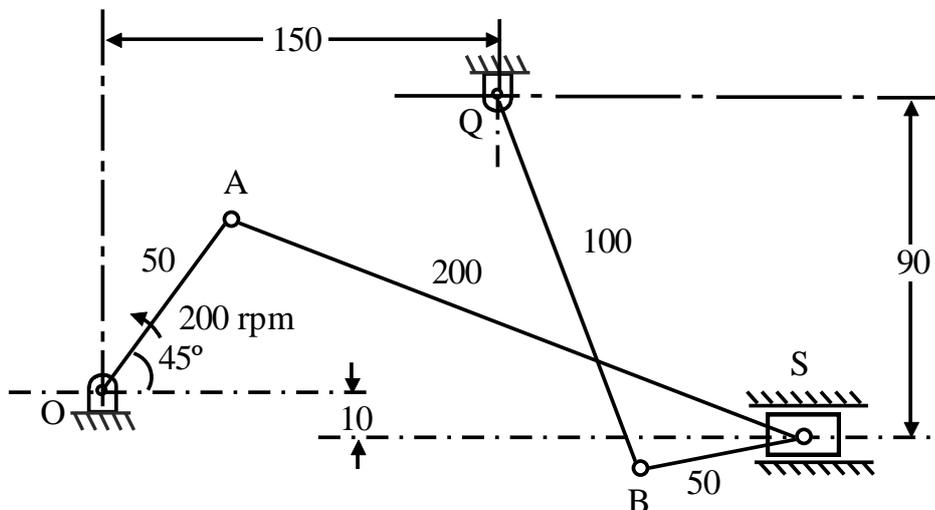


Fig. 3.1

- b) What are centripetal and tangential components of acceleration? When do they occur? **4**

OR

4. a) What is the Coriolis acceleration component? In which cases does it occur? How is it determined? **6**
- b) In the toggle mechanism shown in fig 4.1 the crank OA rotates at 210 rpm counter-clockwise increasing at the rate of 60 rad/s². For the given configuration, determine **10**
- a) Velocity of slider D and the angular velocity of link BD
- b) Acceleration of slider D and the angular acceleration of link BD.

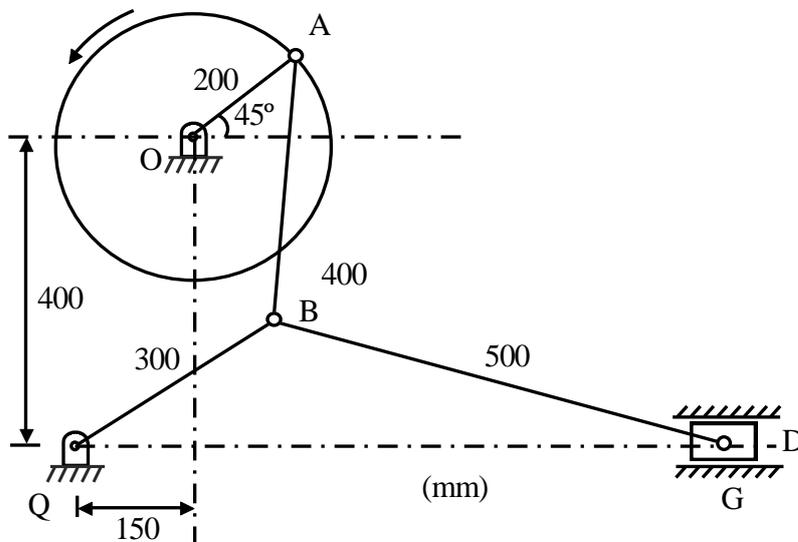


Fig. 4.1

5. a) What is cam? What type of motion can be transmitted with a cam and follower combination? What are its elements? **6**
- b) Use the following data in drawing the profile of a cam in which a knife-edged follower is raised with uniform acceleration and deceleration and is lowered with simple harmonic motion. **10**
- Least radius of cam = 60 mm
 Lift of follower = 45 mm
 Angle of ascent = 60°
 Angle of dwell between ascent and descent = 40°
 Angle of descent = 75°
 If the cam rotates at 180 rpm, determine the maximum velocity and acceleration during ascent and descent.

OR

6. a) What are the requirements of a high-speed cam? Which follower programme do you recommend for a high-speed cam and why? **6**
- b) The following data relate to a circular cam operating a flat-faced follower; **10**
- Least diameter = 40 mm
 Lift = 12 mm
 Angle of action = 160°
 Speed = 500 rpm
 If the period of acceleration of the follower is 60° of the retardation during the lift, determine the, (i) main dimensions of the cam (ii) acceleration of the main points. What is the maximum acceleration and deceleration during the lift?

7. a) Compare the Cycloidal Teeth and Involute Teeth in gears. **5**
- b) Define the following in gears **6**
- i) Pitch Circle.
- ii) Circular Pitch.
- iii) Module.
- c) Explain the Interference and Undercutting with neat sketch between rack and pinion. **5**

OR

8. a) What are the main tooth profiles of gear teeth which fulfill the law of gearing? Compare them. **5**
- b) Find relations to calculate the pitch angles of bevel gears. **5**
- c) The centre distance between two spur gears in a mesh is to be approximately 275 mm. The gear ratio is 10 to 1. The pinion transmits 360 kW at 1800 rpm. The pressure angle of the Involute teeth is 20° and the addendum is equal to one module. The limiting value of normal tooth pressure is 1kN/mm of width. Determine the **6**
- i) Nearest standard module so that interference does not occur
- ii) Number of teeth on each gear wheel, and
- iii) Width of pinion.

9. a) What are the various kinds of friction? Discuss each in brief. **5**
- b) Write short note on anti friction bearing. **5**
- c) What is clutch? Draw a neat sketch of single plate clutch and describes its working. **6**

OR

10. a) Discuss the effect of slip of belt on the pulleys on the velocity ratio of a belt drive. **5**
- b) What do you mean by crowning of pulleys in flat-belt drives? What is its use? **5**
- c) The initial tension in a belt drives is found to be 600 N and the ratio of friction tensions is 1.8. the mass of the belt is 0.8kg/m length. Determine the **6**
- i) Velocity of the belt for maximum power transmission.
- ii) Tension on the tight side of the belt when it is started.
- iii) Tension on the tight side of the belt when running at maximum speed.
