

(3 Hours)

Total Marks: 80

N.B. 1) Question No.1 is compulsory.

2) Attempt any three questions out of the remaining five questions.

3) Figures to the right indicate full marks.

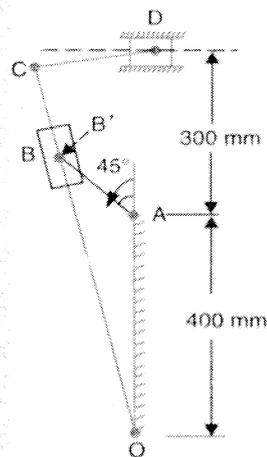
4) Assume suitable data wherever required but justify the same.

Q1. Attempt any four

- A. What are the different types of constrained motions? (5)
- B. What do you mean by chordal action of chains? (5)
- C. What are the different types of instantaneous centers? (5)
- D. State and explain D'Alembert's Principle (5)
- E. Classify Cam in detail. (5)

Q2 A. A mechanism of a crank and slotted lever quick return motion is shown in the figure. If the crank rotates counter clockwise at 120 rpm, determine for the configuration shown, the velocity and acceleration of the ram D. Also determine the angular acceleration of the slotted lever. (15)

Crank AB = 150 mm, Slotted arm OC = 700 mm and link CD = 200 mm.

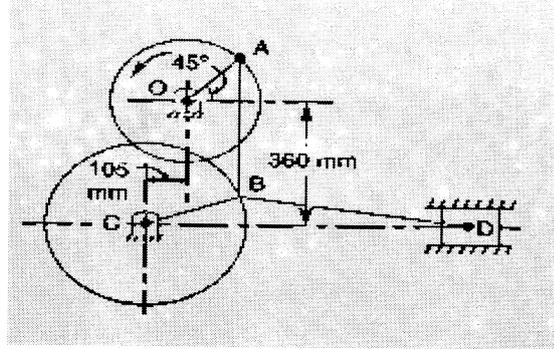


B. Differentiate between machine and structure. (5)

- Q3 A.** In a Toggle mechanism, as shown in figure, the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter clockwise direction at a speed of 180 rpm. The dimensions of the various links are; OA = 180 mm, CB = 240 mm, AB = 360 mm and BD = 540 mm. (15)

For the given configuration, find;

- Velocity of slider D
- Angular velocity of links AB, CB and BD
- Velocities of rubbing on the pins of diameter 30 mm at A and D
- Torque applied to the crank OA for a force of 2 kN at D.



- B.** Differentiate between involute and cycloidal gear tooth profile. (5)
- Q4 A.** An open belt drive running at 2.5 m/s transmits 2.5 kW. The angle of lap on the smaller pulley is 165° and the coeff. of friction between belt and pulley being 0.30. Determine the effect on power transmission if initial tension is increased by 10%. (10)
- B.** A cam operating a knife edge follower has the following data: (10)
- It lifts the follower through 3.75 cm during its 60° rotation.
 - Follower remains at rest for next 40° rotation of the cam.
 - Follower descends to its original position during 90° rotation of the cam.
 - Follower remains at rest for the rest of the revolution.
- If the displacement of the follower is to take place with motion and SHM the cam rotates at 300 rpm find the maximum velocity and acceleration of the follower during ascent and descent and draw the displacement diagram only.
- Q5 A.** The following data relate to two meshing involute gears: (10)
- Number of teeth on the gear wheel = 60; Pressure angle = 20° ; Gear ratio = 1.5; Speed of the gear wheel = 100 rpm; Module = 8 mm.
- The addendum on each wheel is such that the path of approach and the path of recess on each side are 40% of the maximum possible length each. Determine the addendum for the pinion and the gear and the length of arc of contact.
- B.** Draw a neat sketch of Tchebicheff mechanism and prove that the lengths of the links must be in the ratio 1 : 2 : 2.5 for a point on the coupler to trace an approximate straight line. (10)
- Q6 A.** Derive an expression for minimum number of teeth required on a pinion to avoid interference in involute gear teeth when it meshes with wheel. (10)
- B.** Explain Davis and Ackerman Steering gear mechanism in detail. (10)
