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B037415(037)

B. Tech. (Fourth Semester) Examination
April-May 2022

AICTE (~~New~~ Scheme)

(Mechanical Engg. Branch)

KINEMATICS of MACHINES

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. From each question part (a) is compulsory each 4 marks and attempts any* ***two*** *from (b), (c) and (d) each are 8 marks.*

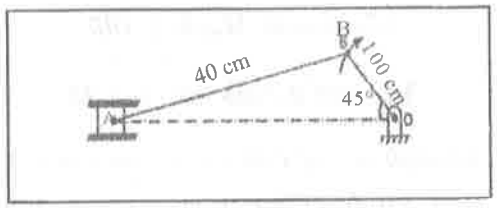
Unit-I

1. (a) Explain different kinds of kinematic pairs giving example for each one of them.

(b) In a four bar chain *ABCD*, *AD* is fixed and is 150 mm long. The crank *AB* is 40 mm long and rotates

at 120 rpm clockwise, while the link $CD = 80$ mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle $BAD = 60$ degree.

(c) Locate all the instantaneous centres of the slider crank mechanism as shown in Fig. 6·12. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find : 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB.



(d) Explain with sketch the instantaneous centre method for determination of velocities of links and mechanisms.

Unit-II

2. (a) What is Pantograph? Explain briefly.

(b) Draw and explain Klien's construction for determining

the velocity and acceleration of the piston in a slider crank mechanism.

(c) Explain how the coriolis component of acceleration arises when a point is rotating about some other fixed point and at the same time its distance from the fixed point varies.

(d) Explain lower pair mechanism. How these mechanism working?

Unit-III

3. (a) Define the following terms as applied to cam with a neat sketch :

(i) Base circle

(ii) Pitch circle

(iii) Pressure angle, and

(iv) Stroke of the follower

(b) Derive the expressions for displacement, velocity and acceleration for a circular arc cam operating a flat-faced follower.

(i) when the contact is on the circular flank, and

(ii) when the contract is on circular nose

(c) A cam is to be designed for a knife edge follower with the following data :

1. Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion.
2. Dwell for the next 30°.
3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion.
4. Dwell during the remaining 180°.

Draw the profile of the cam when

(a) the line of stroke of the follower passes through the axis of the cam shaft, and

(b) the line of stroke is offset 20 mm from the axis of the cam shaft.

The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.

(d) Write short notes on cams and followers. Explain with sketches the different types of cams and followers.

Unit-IV

4. (a) What do you understand by 'gear train'? Discuss the various types of gear trains.

(b) How the velocity ratio of epicyclic gear train is obtained by tabular method?

(c) Explain briefly the differences between simple, compound and epicyclic gear trains. What are the special advantages of epicyclic gear trains?

(d) What are the various types of the torques in an epicyclic gear train?

Unit-V

5. (a) Discuss briefly the various types of friction experienced by a body.

(b) From first principles, deduce an expression for the friction moment of a collar thrust bearing, stating clearly the assumptions made.

(c) Derive the condition for transmitting the maximum power in a flat belt drive.

(d) Describe with the help of a neat sketch the principles of operation of an internal expanding shoe. Derive the expression for the braking torque.