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NATIONAL INSTITUTE OF TECHNOLOGY, HAMIRPUR (H.P.)- 177 005
B.Tech. End Semester Examination November-December 2023

Branch: Mechanical Engineering Semester: Third
Course name: Kinematics of Machines Course Code: ME-211
Time allowed: Two hours Maximum marks: 50
Date of exam: 20.11.2023 Session A (9:30 AM TO 12:30 PM)

NOTE: Attempt all the questions which carry marks as indicated in the bracket.

- I (a) Explain different kinds of kinematic pairs giving example for each of them. (6)
(b) Draw neatly the following inversions of Double Slider Crank Chain: (2,2)
i) Elliptical trammels and ii) Oldham's coupling
- II The crank of a slider crank mechanism rotates at a constant speed of 300 r.p.m in clockwise direction. The crank radius is 150 mm and the connecting rod length is 600 mm. Determine :
i) linear velocity and acceleration of midpoint of the connecting rod and
ii) angular velocity and angular acceleration of the connecting rod at a crank angle of 45° from IDC position. Draw neat space, velocity and acceleration diagrams. (3,3,4)
- III A leather belt is required to transmit 7.5 kW from a pulley 1.2 m in diameter, running at 250 r.p.m. The angle embraced is 165° and the coefficient of friction between the belt and the pulley is 0.3. If the density of leather is 1 Mg/m^3 , working stress for the belt material is 1.5 MPa and the thickness of belt is 10 mm, determine the width of the belt taking centrifugal tension into account. Also derive the expression used for the ratio of the driving tensions for flat belt. (6,4)
- IV(a) Sketch neatly different types of cams and followers. (4)
(b) A cam is to be designed for a knife edge follower with the following data:
i) Cam lift of 40 mm during 90° of cam rotation with simple harmonic motion.
ii) Dwell for the next cam rotation of 30° .
iii) During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion.
iv) Dwell during the remaining 180° .
Draw the profile of the cam when the line of stroke of the follower passes through 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. (2,2,2)
- V (a) Draw neat sketches of the following:
i) A simple gear train with one intermediate gear and (2.5X2)
ii) A compound gear train
- (b) Write SHORT note on any two of the following.
i) Types of Instantaneous centre ii) Selection of gear and materials and iii) Brakes

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