337414(37)

B. E. (Fourth Semester) Examination, April-May 2021

(Old Scheme)

(Mechanical, Mechatronics Engg. Branch)

KINEMATICS of MACHINES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all question, each question carries equal marks. Attempt for 16 marks. Part 'a' of each is compulsory. Assume suitable data if missing.

1. (a) Define Kinematic chain.   2

    (b) Explain with sketch the various inversions of a slider crank chain.   7

    (c) In a four-link mechanism, the dimensions of the links

are as under : AB = 50 mm, BC = 66 mm, CD = 56 mm and AD = 100 mm. At the instant when $\angle DAB = 60°$, The link AB has an angular velocity of 10.5 rod/s in the counter clockwise direction. Determine :

(i) Velocity of the point 'C'.

(ii) Velocity of the point 'E' on the link BC when BE = 40 mm

(iii) Velocity of an offset point F on the link BC if BF = 45 mm. CF = 30 mm and BCF is read clockwise.

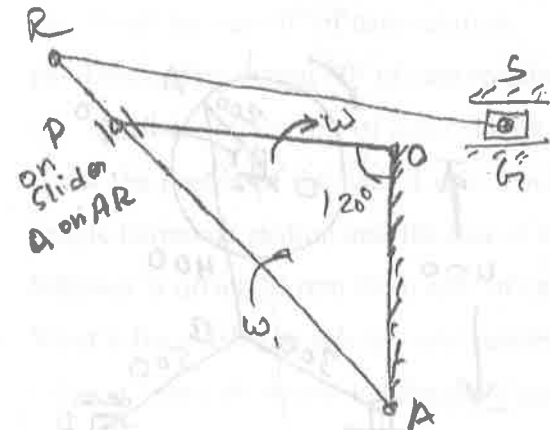(iv) Velocity of an offset point G on the link CD if CG = 24 mm, DG = 44 mm and DCG is read clockwise. 7
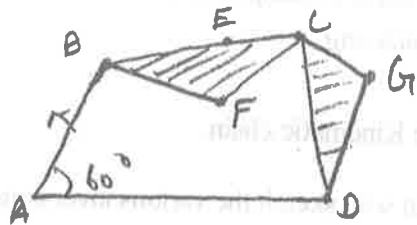
(d) In a quick return mechanism of the slotted lever

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 velocity of the cutting tool at 'S' and the angular velocity of the link RS. The crank OF rotates at 210 rpm. 7

2. (a) Define centripetal component of acceleration. 2

(b) What we the coriolis acceleration compound? In what cases does it occur? How it is determined. 14

Or

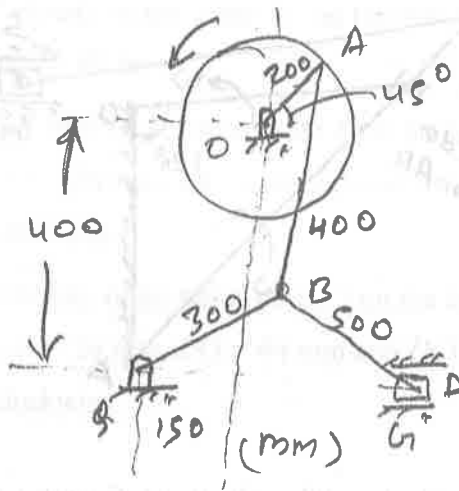(c) In the toggle mechanism as shown in figure, the crank OA rotates at 210 rpm counter-clockwise

increasing at the rate of 60 rad/S^2. For the given configuration, determine :

(i)   Velocity of slider D' and the angular velocity of linke ED.

(ii) Acceleration of slider 'D' and the angular acceleration of link BD.   14

3. (a) Define Pitch Circle.   2

   (b) What is tangent cam? Find the expression for the velocity and acceleration of a roller follower for such a cam.   14

Or

(c) A cam with a minimum radius of 25 mm is to be designed for a knife edge followes with the following data :

   (i)   To raise the follower through 35 mm during 60° rotation of cam.

   (ii) Dwell for nee 40° of cam rotation.

   (iii) Descending during 90° of cam rotation.

   (iv) Dwell during the rest of cam rotation.

   Draw the profile of the cam if it is moving with simple harmonic motion and the line of stroke of follower is offset 10 mm from axis of cam shaft.

   What is the maximum velocity and acceleration of follower during the ascent and descent if cam rotates at 150 rpm?   14

4. (a) Define module in terms of gear.   2

   (b) Distinguish between cycloidal and involute tooth form. 7

   (c) Find the minimum number of teeth on a pinion of standard addedndum and 20° pressure angle to avoid interference between a rock and pinion.   7

(d) Explain the procedure to analyse an epicyclic gear train.   7

5. (a) What are the laws of solid dry friction?   2

(b) In a thrust bearing, the external and internal diameter of the contacting surfaces are 320 mm and 200 mm respectively. The total axial load is 80 kN and two intesity of presure is 350 kN/m². The slaft rotates of 400 rpm. Taking the coefficient of friction is 0.06. Calculate the power lost in overcoming the friction. Also find two number of collers required for the bearing.   7

(c) A simple band brake is applied to a shaft carrying a flywheel of 250 kg mass and of radius of gyration of 300 mm. The shaft speed is 200 rpm. The drum diameter is 200 mm and the coefficient of friction is 0.25. Determine the (i) Bralle torque when a force of 120 N is applied to the lever end (ii) Number of turns of the flywheel before it comes to rest (iii) time taken by the flywheel to come to rest.   7
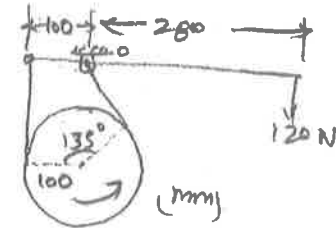
(d) Describe the construction and working of any type of transmission dynamometer.   7