

**R16**

Code No: 133BB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, February - 2024

**KINEMATICS OF MACHINERY**

(Mechanical Engineering)

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART - A**

(25 Marks)

- 1.a) How the links are classified? [2]
- b) Classify the kinematic pairs. [3]
- c) How to find the velocity of point on the link? [2]
- d) Describe one application of relative velocity method. [3]
- e) Which are lower and higher pairs? [2]
- f) Describe one application of hook's joint. [3]
- g) How cams are classified? [2]
- h) When does the maximum velocity is attained in SHM during forward stroke? [3]
- i) What is simple and compound gear train? [2]
- j) What method is followed in drawing an involute profile? [3]

**PART - B**

(50 Marks)

2. Draw the inversions of single slider crank mechanism with neat sketches. [10]

**OR**

- 3.a) Sketch and explain the working of an Oldham coupling.
- b) Two parallel shafts are connected by an Oldham coupling. The distance between the shafts is 35 mm. The speed of the driving shaft is 600 rpm. What is the maximum speed of sliding of the tongue of the intermediate piece with respect to the slot in the flange? [5+5]

- 4.a) How to find the velocity at pin joints and relative velocities in a slider crank mechanism?
- b) How to find acceleration of a point on a link? [5+5]

**OR**

5. Consider a reciprocating engine mechanism in which the crank OA rotates at 100 rpm clockwise, and OA has turned through  $40^\circ$  from its IDC position. The crank length is 40 mm, and the connecting rod is 100 mm long. Find *analytically* the linear velocity and acceleration of the piston, and the angular velocity and angular acceleration of the connecting rod. [10]

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- 6.a) Sketch and explain the Watt's straight line mechanism and mention the conditions.  
 b) Bring out the difference between Watt's mechanism and Scott-Russel mechanism. [5+5]

OR

7. In the Figure 1(a) shows the Ackermann steering gear in neutral position, and the Figure 1(b) shows the steering gear when the vehicle turns to the right. How would you determine the value of  $\alpha$  for a given configuration? [10]

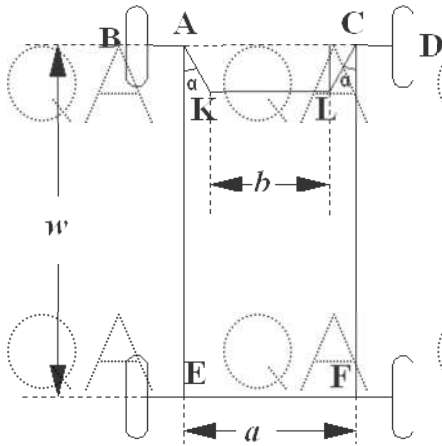


Figure 1(a)

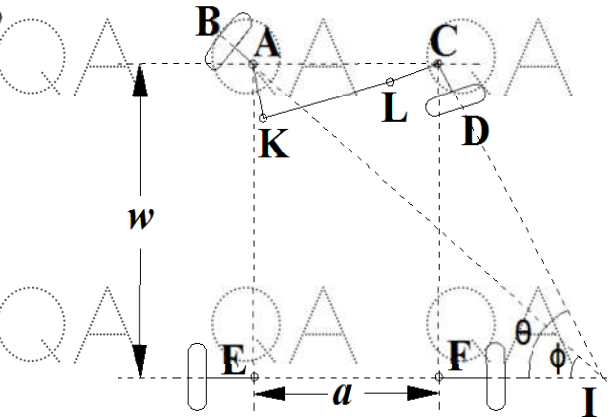


Figure 1(b)

8. Draw the profile of a cam, when the follower rises outward 18 mm with uniform velocity in  $130^\circ$  of cam rotation. Dwell for  $25^\circ$ , fall to the initial position with uniform velocity in  $120^\circ$  of cam rotation. Draw the displacement diagram of the follower with in-line flat follower and the minimum diameter of cam is 60mm. [10]

OR

9. A symmetrical circular cam operates a roller follower with a lift of 30 mm. The minimum radius of the cam is 50 mm, the roller radius is 18 mm, and the nose radius is 12 mm. The angle of lift is  $80^\circ$ . If the speed of the cam is 210 rpm, find the main dimensions of the cam, and the acceleration of the follower at (a) the beginning of the lift, and (b) the apex of the nose. [10]

- 10.a) How the gears are classified and explain the importance of worm and worm gearing?  
 b) What is interference of gear teeth and how can it be avoided? [5+5]

OR

11. Describe a differential with the help of a sketch. Prove that the two rear wheels will rotate at different speeds with its help when rounding a curve. [10]

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