

Code No: 133BB

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, April/May - 2018

KINEMATICS OF MACHINERY

(Common to ME, MSNT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

*Illustrate your answers with NEAT sketches wherever necessary.***PART- A****(25 Marks)**

- 1.a) What is the difference between Mechanism, Machine, and Structure? [2]
- b) What is *Gruebler's criterion* to find the degrees of freedom of a mechanism? Why is it sufficient to use the *Gruebler's criterion* instead of the *Kutzback's criterion* for plane mechanisms? [3]
- c) What is the difference between the magnitude, direction and sense of the velocity of a point on a link? [2]
- d) If a link AB is rotating with an angular velocity of ω and angular acceleration α , and the acceleration of the point A is known completely (in magnitude, direction, and sense) and the acceleration of the point B is known only in direction, how do you determine the acceleration of B? [3]
- e) What is the main advantage of the Hart mechanism over the Peaucellier mechanism, and what is its limitation? [2]
- f) List the advantages and disadvantages of Davis steering gear. [3]
- g) Define Cam, and explain its use. [2]
- h) What are the Cams with specified contours? Why are they necessary? Explain their advantages and disadvantages. [3]
- i) Define 'Pressure angle' or 'Angle of Obliquity'. What are the normal values used for this? [2]
- j) What is the difference between a simple gear train and a compound gear train? Explain with the help of sketches. [3]

PART-B**(50 Marks)**

- 2.a) Distinguish between incompletely constrained motion and successfully constrained motion, with examples.
 - b) In a crank and slotted lever mechanism, the driving crank is 35 mm long, and the time ratio of cutting stroke to return stroke is 1.6. If the length of working stroke of the ram is 110 mm, find the distance between the fixed centers, and the slotted lever length. [5+5]
- 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. In the mechanism shown in Figure 1, the driving crank OC rotates *ccw* about the fixed point O at a uniform speed of 150 rpm. The lever BD is pivoted about the pin D which is fixed and oscillates about D, A coupler BC connects the points B and C, The die block F, driven by the link EF moves in the horizontal guides. When the crank angle is 45° , find the velocity of F, using the *Instantaneous center method*. OC = DE = 15mm, CB = BD = 45mm, EF = 25 mm. [10]

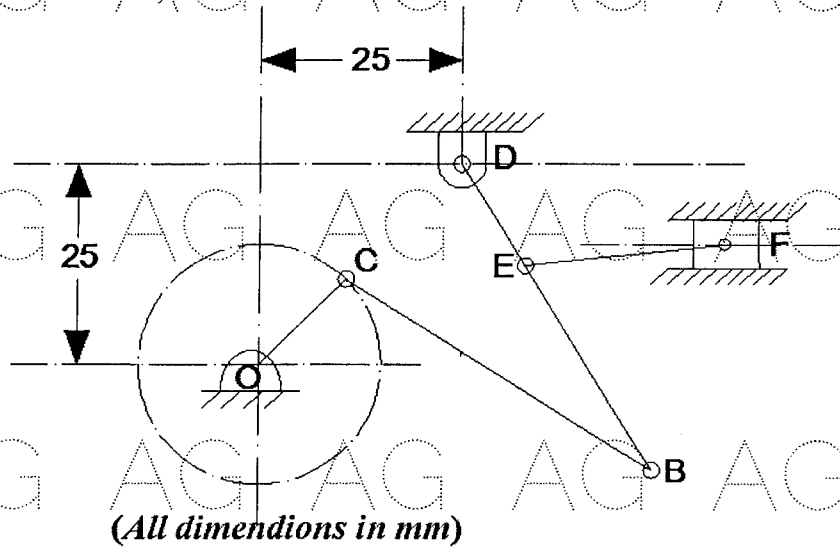


Figure: 1
OR

5. Consider a reciprocating engine mechanism in which the crank OA rotates at 100 rpm *clockwise*, and OA has turned through 40° 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]
- 6.a) In a Double Universal joint, what happens if the intermediate shaft is inadvertently placed in such a manner that its forks lie in planes perpendicular to each other?
- b) Draw a neat sketch of the Peaucellier straight line motion mechanism, and prove that it produces an exact straight line motion. [5+5]

OR

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7. In the Figure 2(a) shows the Ackermann steering gear in neutral position, and the Figure 2(b) shows the steering gear when the vehicle turns to the right. How would you determine the value of α for a given configuration? [10]

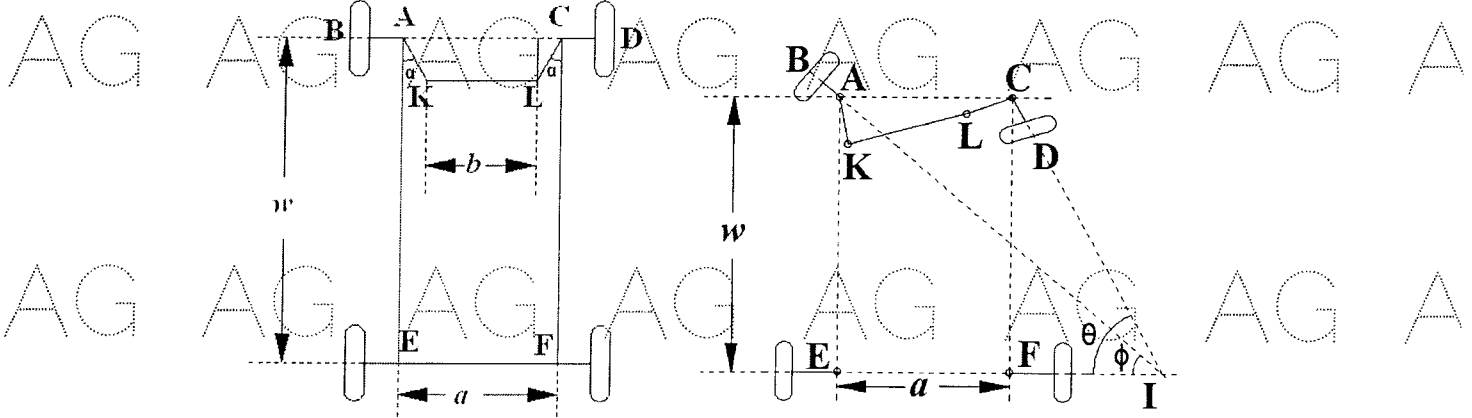


Figure: 2(a)

Figure: 2(b)

8. Draw the profile of a cam to give the following motion to a flat – faced follower:
 a) Follower to rise through 36 mm during 120° of cam rotation with uniform velocity
 b) Follower to dwell for 50° of cam rotation
 c) Follower to return to its initial position during 90° of cam rotation with SHM
 d) Follower to dwell for the remaining period of cam rotation
 The minimum radius of cam is 50 mm. Also find the minimum width of the Follower from the cam profile diagram. [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° . 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) Define the 'Law of Gearing'. Derive the expression for the same.
 b) Two spur gear wheels with 18 and 26 teeth gear together. The addendum of each wheel is equal to one module, and pressure angle is 20° . Find the length of the arc of contact. [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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