

**II B. Tech I Semester Supplementary Examinations, July - 2022**  
**KINEMATICS OF MACHINERY**  
(Mechanical Engineering)

Time: 3 hours

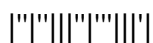
Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit  
All Questions carry **Equal** Marks

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- 1 a) Explain the applications of Kutzbach criterion to plane mechanisms. [7M]  
b) A double slider mechanism is used to draw an ellipse with major axis equal to 20 cm and minor axis 15 cm. Set out the mechanism, and draw the locus of the points tracing the required ellipse. [7M]
- Or
- 2 a) Identify the degrees of freedom for four bar mechanism, slider crank mechanism and five bar mechanism. [6M]  
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. [8M]
- 3 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? [7M]  
b) Draw a neat sketch of the Peaucellier straight line motion mechanism, and prove that it produces an exact straight line motion. [7M]
- Or
- 4 a) Draw a neat sketch of the Robert's mechanism, and explain its working. How do you find the location of the (tracing) point P which produces the approximate straight line motion? [6M]  
b) A Hooke's joint is used to connect two shafts. The driving shaft is rotating with a uniform speed of 600 rpm. The maximum speed of the driven shaft is 630rpm. Find the minimum speed of the driven shaft. [8M]
- 5 a) Locate all the Instantaneous centers of slider crank mechanism with crank length of 25mm rotating clockwise at a uniform speed of 100 rpm. The crank makes 450 with IDC and the connecting rod is 400 mm long. Determine the velocity of the slider and the angular velocity of connecting rod? [7M]  
b) In a slider-crank mechanism, the lengths of the crank and the connecting rod are 200mm and 800mm respectively. Locate all the I-centres of the mechanism for the position of the crank when it has turned  $30^{\circ}$  from the inner dead centre. Also, find the velocity of the slider and the angular velocity of the connecting rod if the crank rotate at 40 rad/s. [7M]

Or



- 6 a) In a slider crank mechanism, the crank OA makes 400 rpm in the counter clockwise direction which is 600 from IDC. The lengths of the links are OA= 60 mm, OB= 220 mm and BA= 280 mm. Determine the velocity and acceleration of the slider B? [7M]
- b) Figure 1 shows a toggle mechanism in which the crank OA rotates at 120 rpm. Find the velocity and the acceleration of the slider at D. [7M]

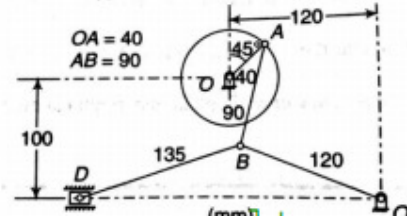


Figure.1

All dimensions are in 'mm'

- 7 a) Explain Convex circular arc cam with neat sketch. [7M]
- b) Deduce expressions for the velocity and acceleration of the follower when it moves with simple harmonic motion. [7M]
- Or
- 8 a) What is a cam? What type of motion can be transmitted with a cam and follower combination? [6M]
- b) The following data is related to a symmetrical circular arc cam operating a flat-Faced follower. Least radius of the cam=27.5 mm, total lift= 12.5 mm, angle of lift=55°, nose radius=3mm speed of cam=600 rpm. Find [8M]
- Distance between cam centre and nose centres,
  - radius of circular flank,
  - angle of contact on the circular flank.

- 9 a) Explain with a neat sketch the "Differential Gear Box". [7M]
- b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of gear is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the contact ratio. [7M]

Or

- 10 a) In a reverted epicyclic gear train, the arm A carries two gears B and C, and a compound gear D – E. The gear B meshes with gear E, and the gear C meshes with gear D. The number of teeth on gears B, C, and D are 75, 30, and 90 respectively. Find the speed and direction of gear C when the gear B is fixed and the arm A makes 100 rpm clockwise. [14M]

