

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.

PART- A**(25 Marks)**

- 1.a) Distinguish open and closed pairs. [2]
- b) Define link? List out types of links [3]
- c) Explain the concept of relative velocity in mechanisms. [2]
- d) What is the magnitude of coriolis component of acceleration? [3]
- e) Write the significance and application of double hooke's joint. [2]
- f) What is pantograph? How it differ from straight line motion mechanism? [3]
- g) Distinguish radial and off set followers used in cam mechanism. [2]
- h) Deduce the expressions for finding maximum velocity and acceleration for simple harmonic motion follower. [3]
- i) Define contact ratio in gears? Write its significance. [2]
- j) What is reverted gear train? Where it is used? [3]

PART-B**(50 Marks)**

- 2.a) How machines are classified? Explain.
- b) Write the inversions of double slider crank mechanism and explain any two of them with neat sketches. [5+5]

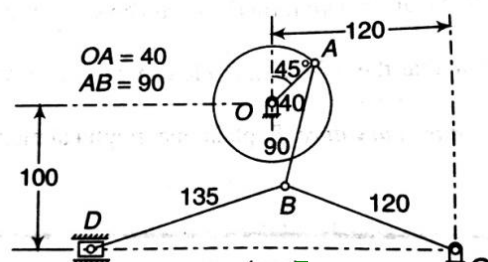
OR

- 3.a) What are quick return mechanisms? Where are they used? Discuss the functioning of any one of them.
- b) Define Grashof's law. State how is it helpful in classifying the four-link mechanisms into different types. [5+5]

4. 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° 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. [10]

OR

5. 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. [10]



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Figure: 1

- 6.a) What is an automobile steering gear? What are its types? Which steering gear is preferred and why?
 b) Derive the condition for correct steering of an automobile? [5+5]

OR

- 7.a) Name approximate straight line motion mechanisms and Explain and prove the point on the link traces exact straight line path for any one mechanism.
 b) Explain and prove that the Hart's mechanism is used for generating exact straight line motion. [5+5]

8. Use the following data in drawing the profile of a cam in which a knife-edged follower is raised with uniform acceleration and deceleration and is lowered with simple harmonic motion:

Least radius of cam = 60 mm

Lift of follower = 45 mm

Angle of ascent = 60°

Angle of dwell between ascent and descent = 40°

Angle of descent = 75°

If the cam rotates at 180 rpm, determine the maximum velocity and acceleration during ascent and descent. [10]

OR

9. Explain various types of follower motions used in cam mechanisms. [10]
 10. The number of teeth on the gear and the pinion of two spur gears in mesh are 30 and 18 respectively. Both the gears have a module of 6 mm and a pressure angle of 20° . If the pinion rotates at 400 rpm, what will be the sliding velocity at the moment the tip of the tooth of pinion has contact with the gear flank? Take addendum equal to one module. Also, find the maximum velocity of sliding. [10]

OR

11. Figure 2 shows an epicyclic gear train. Two planet gears B and C having 30 teeth each are attached to the arm E and Gear A is having 40 teeth instead of 50, then find the number of revolutions made by the arm when:
 a) gear A makes one revolution Clockwise and D makes half a revolution anticlockwise and
 b) gear A makes one revolution clockwise and D is stationary. [10]

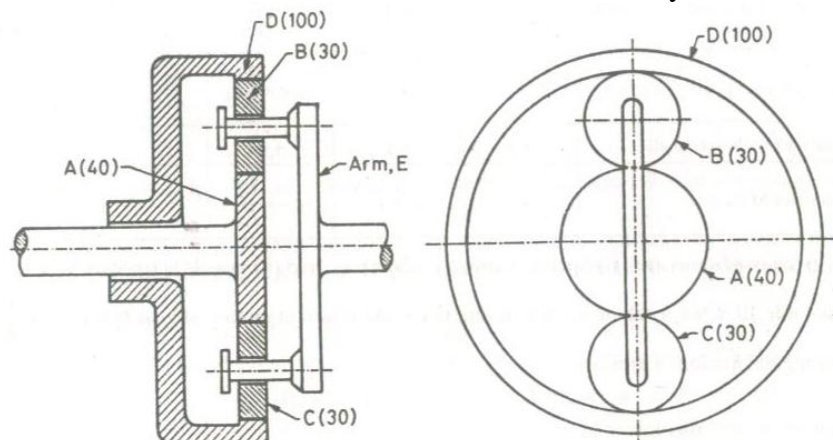


Figure: 2