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**A – 6488**

Reg. No. : .....

Name : .....

**Fifth Semester B.Tech. Degree Examination, October 2016**

**(2013 Scheme)**

**Branch : MECHANICAL ENGINEERING**

**13.502 : Theory of Machines (MP)**

Time : 3 Hours

Max. Marks : 100

***Instruction : Answer all the questions.***

**PART – A**

**(10×2=20 Marks)**

1. What do you understand by '*Inversion*' of a Kinematic chain ?
2. State Grashof's Law.
3. What is the difference between a shoe brake and a band brake ?
4. What is the difference between absorption type and transmission type dynamometer ?
5. Define the term 'Pressure Angle' related to cam.
6. List the classifications of cam and follower.
7. State the law of gearing.
8. Define the term *undercutting* in gears.
9. What do you mean by centrifugal tension ?
10. Define the term 'Slip' in belt drives.

**PART – B**

**(4×20=80 Marks)**

Answer **any one full** question from **each** Module.

**Module – I**

11. i) Name different types of Approximate Straight Line Motion mechanism. Explain any one of them with neat diagram.

**10**

**P.T.O.**



- ii) Discuss the classification of kinematic pairs according to :
  - a) Nature of contact between the links
  - b) Nature of relative motion between the links.

10

OR

12. Determine the degrees of freedom of the following mechanisms shown in Figure. 1 (a) and (b).

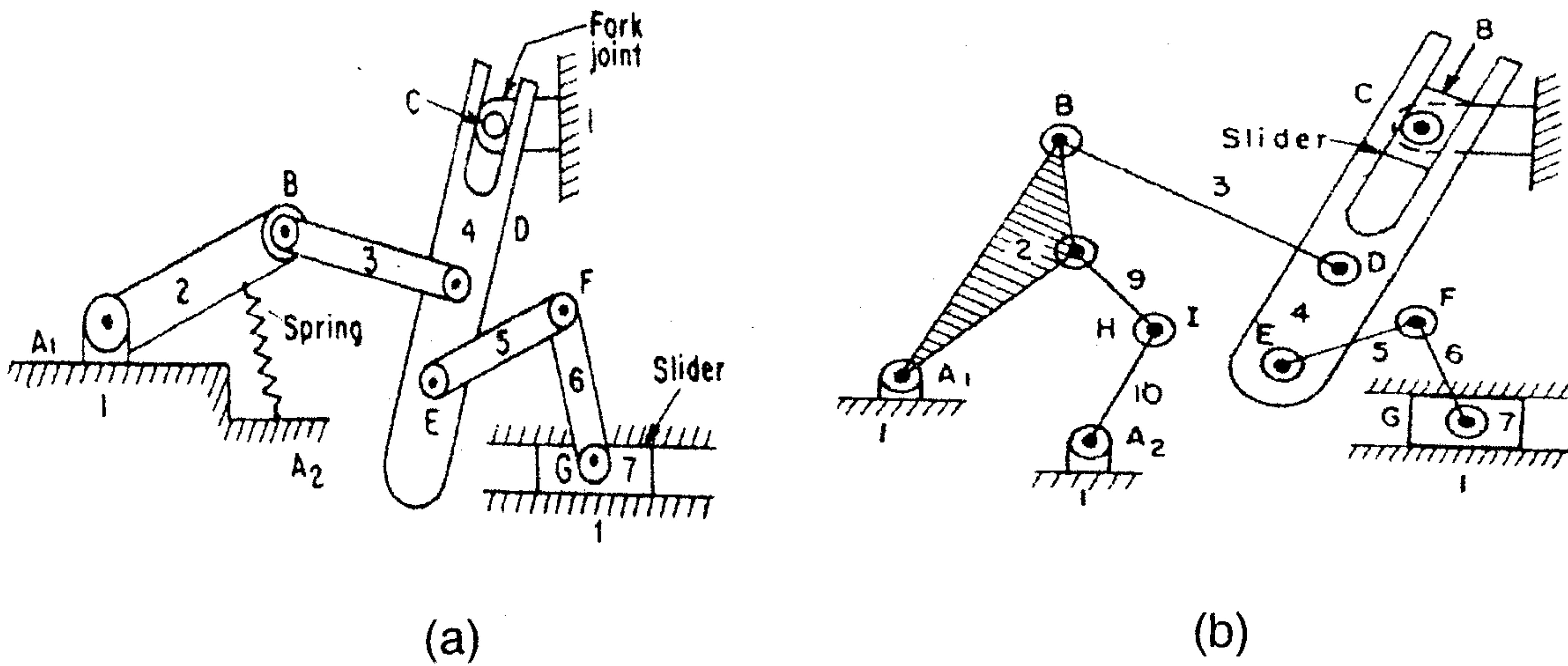


Figure 1 Mechanisms

20

**Module - II**

13. In the slider crank mechanism shown in Fig. 2, block P reciprocates along the fixed line A and the crank has a uniform speed of 230 rpm. Determine for the given configuration, the velocity and acceleration of the block P and the point D.

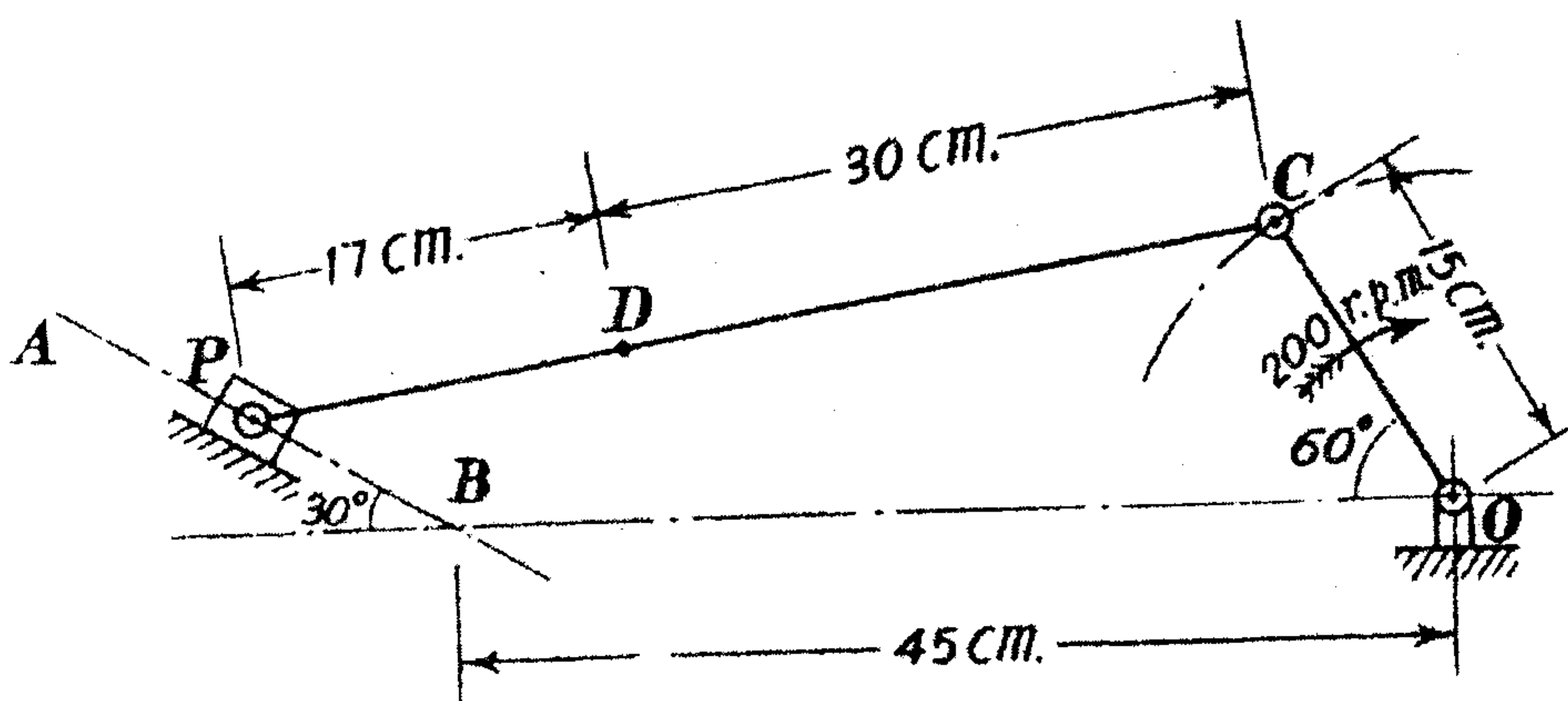


Figure 2 Slider Mechanism.

20

OR



14. In the mechanism shown in Fig. 3, the slider moves uniformly vertically downwards at 5 m/sec. The various dimensions of the link are  $AB = 15 \text{ cm}$ ,  $AC = 10 \text{ cm}$ ,  $CD = 20 \text{ cm}$ .

Determine :

- a) Linear velocity of slider links 4 and 6
- b) Angular velocity of link 5
- c) Linear acceleration of slider 6
- d) Angular acceleration of links 3 and 5.

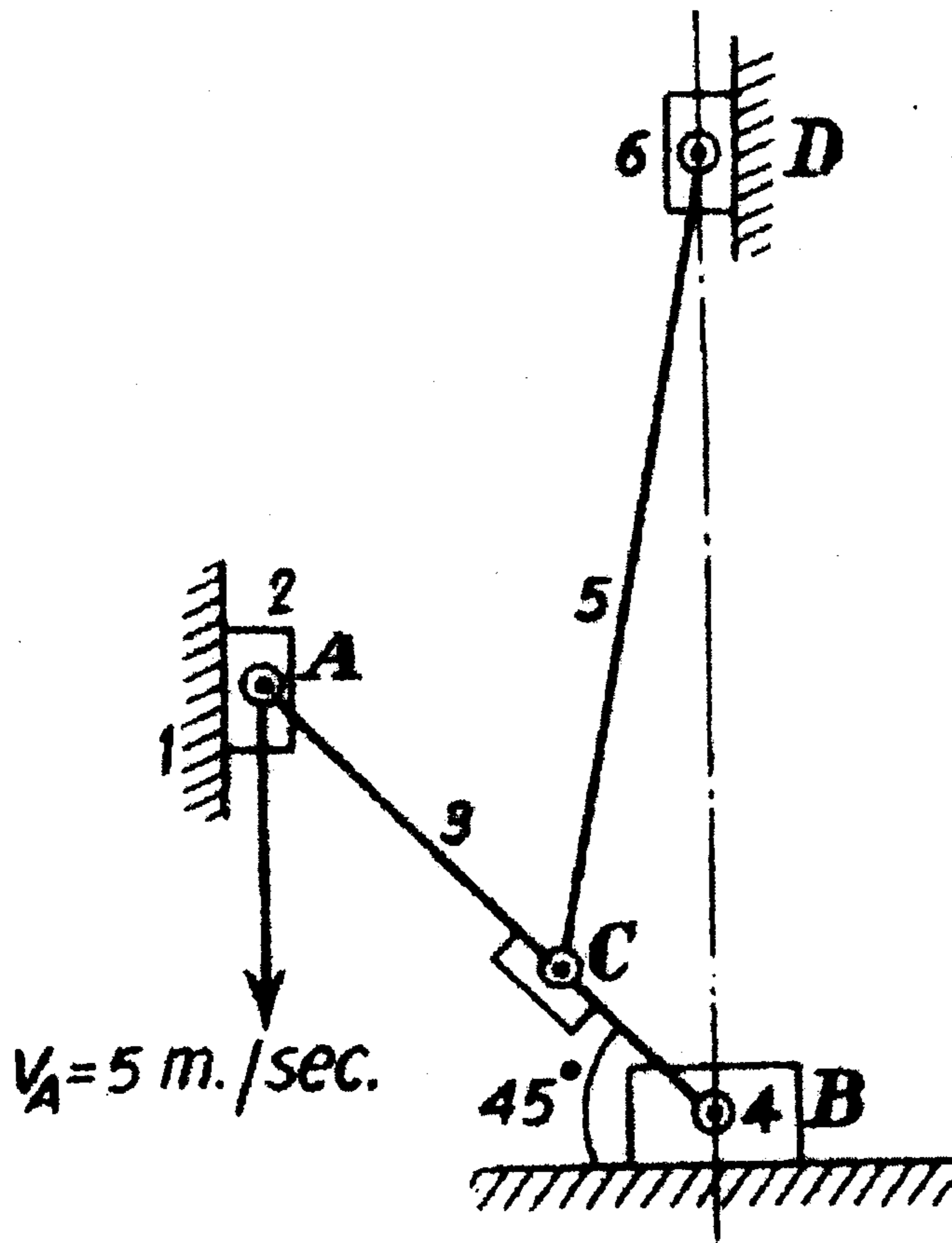


Figure 3 Slider Mechanism

**Module – III**

15. Draw the profile of a cam operating a knife – edged follower having a lift of 40 mm. The cam raises the follower with SHM for  $120^\circ$  of its rotation followed by a period of dwell for  $80^\circ$ . The follower descends for the next  $80^\circ$  rotation of the cam with uniform velocity, again followed by a period of dwell. The cam rotates at a uniform velocity of 150 rpm and has a least radius of 30 mm. What will be the maximum velocity and acceleration of the follower during the lift ? 20

OR

16. a) With the help of a neat sketch, discuss the nomenclatures of a spur gear. 8
- b) A pinion with 24 involute teeth of 150 mm PCD drives a rack. The addendum of the pinion is 6 mm. Find the least pressure angle which can be used if undercutting of the teeth is to be avoided. Using this pressure angle, find the length of the arc of contact and the minimum number of teeth in contact at one time. 12

**Module – IV**

17. In a thrust bearing, the external and internal diameters of the contacting surfaces are 380 mm and 240 mm respectively. The total axial load is 100 kN and the intensity of pressure is not to exceed  $0.4 \text{ N/mm}^2$ . The shaft rotates at 350 rpm. Taking the coefficient of friction as 0.05, calculate the power lost in overcoming the friction. Also find the number of collars required for the bearing. 20

OR

18. Two pulleys of diameters 450 mm and 150 mm are mounted on two parallel shafts 2 m apart and are connected by a flat belt drive. Find the power which can be transmitted by the belt when the larger pulley rotates at 180 rpm. The maximum permissible tension in the belt is 1 kN and the coefficient of friction between the belt and the pulley is 0.25. Also find the length of the cross belt required and the angle of arc of contact between the belt and pulleys. 20

