

(3 Hours)

[Total Marks: 80]

- N.B. (1) Question No. 1 is compulsory
 (2) Attempt any **three** questions out of the remaining **five** questions.
 (3) Figures to the **right** indicate **full marks**.
 (4) Assume suitable data wherever required but justify the same.

1. Write short note on any 4 of the following

- (a) Types of Joint
- (b) Paeucellier Mechanisms.
- (c) Types of Gear Train.
- (d) Complex Mechanism
- (e) Classification of follower

[20]

2. (a) A right circular cylinder of mass m & radius ' r ' is suspended from a chord that is wound around its circumference. If the cylinder is allowed to fall freely, determine the acceleration of its mass centre and the tension induced in the chord.

[8]

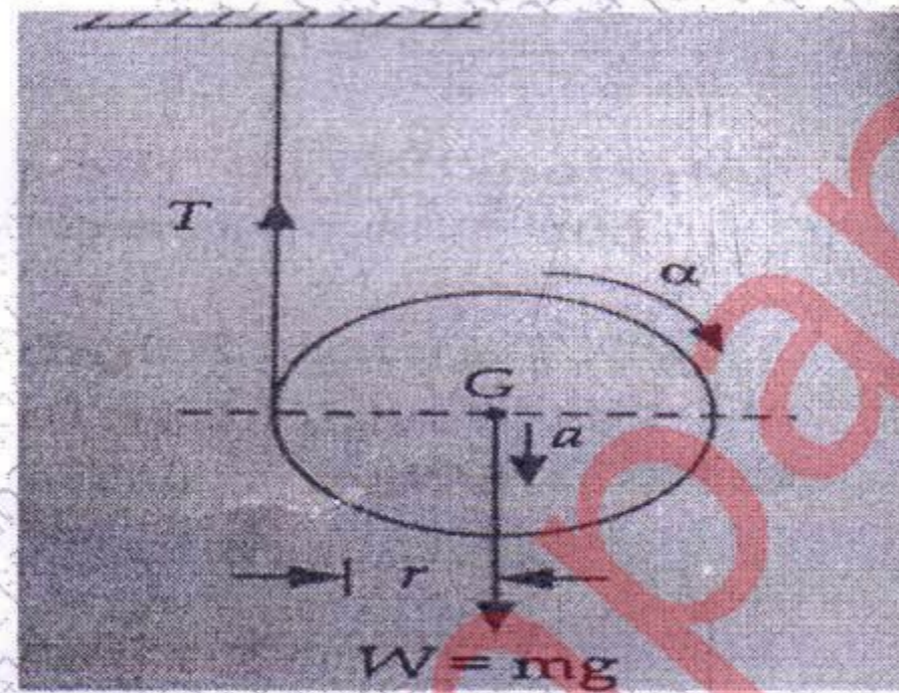


Figure 1

- (b) Write short note on mechanism used in image scanner.

[6]

- (c) What is Kutzbach's criterion for degree of freedom of plane mechanisms? In what way is Grubler's criterion different from it?

[6]

3. (a) Fig. 2 shows a six-link mechanism. The dimensions of the links are $OA = 220$ mm, $AB = 485$ mm, $BQ = 310$ mm, $BC = 590$ mm and $CD = 400$ mm. for the position when the crank OA makes an angle of 60° with the vertical, find the the velocity of the slider D by ICR method. the crank OA rotates clockwise at 150 rpm.

[14]

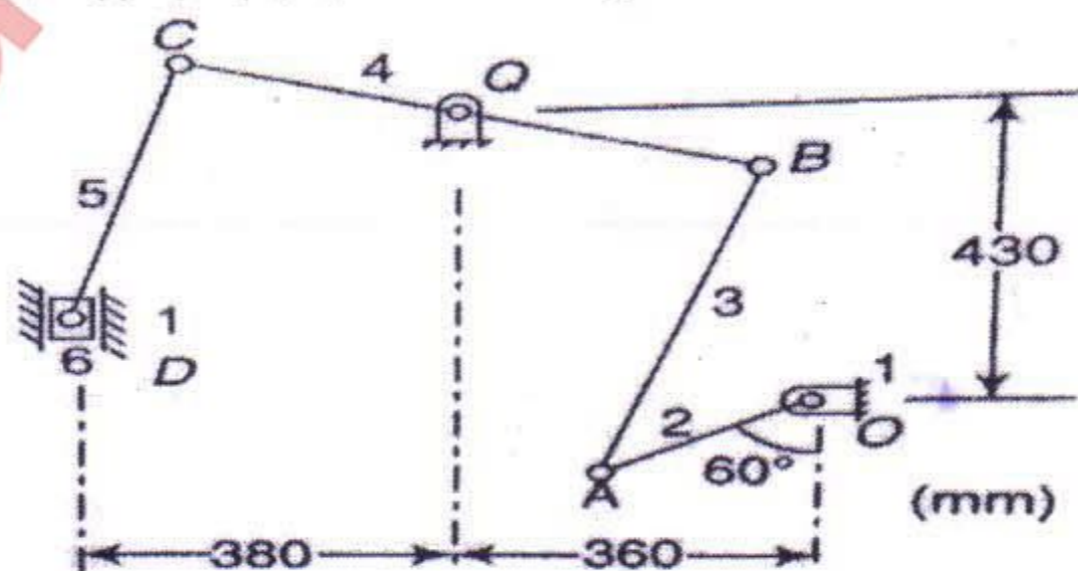


Figure. 2

- (b) How can we ensure that a Tchebicheff mechanism traces an approximate straight line. [6]
4. (a) Design a slider-crank mechanism to coordinate three position of the input and of the slider for the following data [10]
- | | |
|--------------------------|--------------------------|
| $\theta_{12} = 30^\circ$ | $S_{12} = 48 \text{ mm}$ |
| $\theta_{13} = 60^\circ$ | $S_{13} = 98 \text{ mm}$ |
| Eccentricity = 22 mm | |
- (b) Two 20° involute spur gears mesh externally and give a velocity ratio of 3. The module is 3 mm and the addendum is equal to 1.1 module. If the pinion rotates at 120 rpm, determine [10]
- (i) minimum number of teeth on each wheel to avoid interference
 - (ii) contact ratio
5. (a) In an open-belt drive, the diameters of the larger and the smaller pulleys are 1.2 m and 0.8 m respectively. The smaller pulley rotates at 320 rpm. The centre distance between the shafts is 4 m when stationary, the initial tension in the belt is 2.8 kN. The mass of the belt is 1.8 kg/m and the co-eff. of friction between the belt and the pulley is 0.25. Determine the power transmitted. [12]
- (b) Explain the terms: Function generation, Path generation and Motion generation. [8]
6. (a) A cam is to give the following motion to a knife-edged follower [14]
- To raise the follower through 30 mm with uniform acceleration and deceleration during 120° rotation of the cam.
 - Dwell for next 30° of the cam rotation
 - To lower the follower with simple harmonic motion during the next 90° rotation of the cam.
 - Dwell for the rest of cam rotation
- The cam has a minimum radius of 30 mm and rotates counter clockwise at uniform speed of 800 rpm.
- Draw the profile of the cam. Also, draw the displacement, velocity and acceleration diagram for the motion of the follower for one complete revolution of the cam indicating main values.
- (b) Explain law of gearing with diagram [6]
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