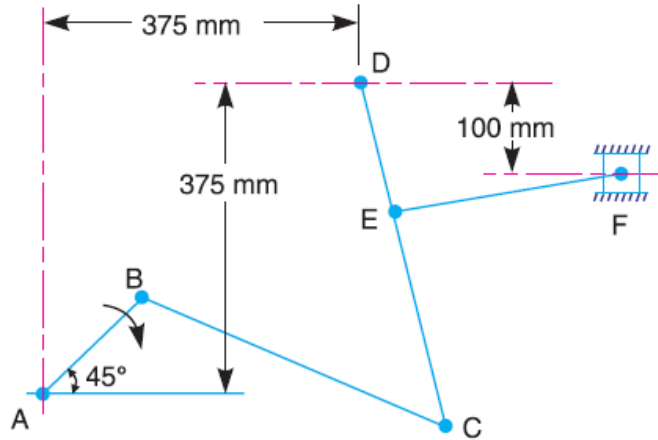


- (b) The length of various links of a mechanism shown in Fig. are as follows: 10
 $AB = DE = 150 \text{ mm}$, $BC = CD = 450 \text{ mm}$, $EF = 375 \text{ mm}$
 The crank AB makes an angle of 45° with horizontal and rotates about A in the clockwise direction at a uniform speed of 120 rpm. The lever DC oscillates about the fixed point D , which is connected to AB by the coupler. The block F moves in the horizontal guide, being driven by the link EF .
 Determine 1. Velocity of the block F 2. Angular velocity of DC , and 3. Rubbing speed at the pin C which is 50 mm in diameter.



- Q-4 Attempt all questions**
- (a) Derive expression for length of belt for cross belt drive 07
 (b) Two 20° involute spur gear mesh externally and give a velocity ratio of 3. The module is 3 mm and the addendum is equal to 1.1 modular. If the pinion rotates at 120 rpm, Determine: (1) Minimum number of teeth on each wheel to avoid interference (2) Contact ratio. 07

- Q-5 Attempt all questions**
- (a) What is gear train? Give classification of it and Explain reverted gear train with neat sketch. 07
 (b) Power is transmitted using a V-belt drive. The included angle of V-groove is 30° . The belt is 20 mm deep and maximum width is 20 mm. If the mass of the belt is 0.35 kg per metre length and maximum allowable stress is 1.4 MPa, determine the maximum power transmitted when the angle of lap is 140° . $\mu = 0.15$. 07

- Q-6 Attempt all questions**
- (a) Derive the equation for torque required to lift the load by a screw jack. 04
 (b) A cam rotating in clockwise direction at a uniform speed of 1000 rpm is required to give a roller follower the motion defined below: 10
 1. Follower moves outwards through 50 mm during 120° of cam rotation.
 2. Follower dwells for next 60° of cam rotation
 3. Follower returns to its original position during next 90° of cam rotation
 4. Follower dwells for rest of cam rotation
 The minimum radius of the cam is 50 mm and the diameter of roller is 10 mm. The line of stroke of follower is off-set by 20 mm from the axis of the cam shaft. If the displacement of the follower is to take place with uniform and equal acceleration and retardation on both the strokes. Draw the profile of the cam and find the max velocity and acceleration during the outwards and return strokes.



Q-7

Attempt all questions

- (a) Define the following terms related to cam. **07**
(i) Base circle (ii) Pitch circle (iii) Cam profile (iv) Stroke of the follower
- (b) The mean diameter of a square threaded screw jack is 50 mm. The pitch of the thread is 10 mm. The coefficient of friction is 0.15. What force must be applied at the end of a 0.7 m long lever, which is perpendicular to the longitudinal axis of the screw to raise a load of 20kN and to lower it? **07**

Q-8

Attempt all questions

- (a) Explain various inversion of a slider-crank mechanism with the help of sketch. **07**
- (b) Two shafts A and B are co-axial. Gear C (50teeth) is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 rpm find the speed of shaft B. **07**

