

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC SEM-II Examination May 2012****Subject code: X21902****Subject Name: Kinematics of Machines****Date: 24/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain different kinds of kinematic pairs giving example for each one of them. **07**
- (b) Sketch and explain the various inversions of a slider crank chain. **07**
- Q.2** (a) Locate all the instantaneous centers of the slider crank mechanism as shown in Fig. 2.1. The lengths of crank OB and connecting rod AB are 10 cm and 40 cm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: 1. Velocity of the slider A, and 2. Angular velocity of the connecting rod AB. **07**

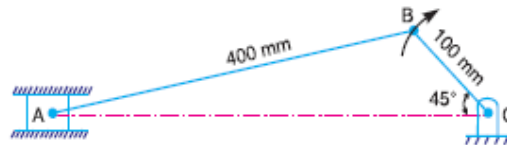


Figure 2.1

- (b) In the mechanism, as shown in Fig. 2.2, the crank OA rotates at 20 rpm anticlockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300 mm; AB = 1200 mm; BC = 450 mm and CD = 450 mm. For the given configuration, determine: 1. velocities of sliding at B and D, 2. Angular velocity of CD, 3. linear acceleration of D, and 4. angular acceleration of CD. **07**

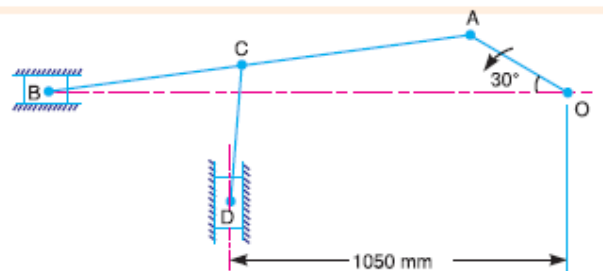


Figure 2.2

OR

- (b) In a mechanism shown in Fig. 2.3, the crank OA is 100 mm long and rotates clockwise about O at 120 rpm. The connecting rod AB is 400 mm long. At a point C on AB, 150 mm from A, the rod CE 350 mm long is attached. This rod CE slides in a slot in a trunnion at D. The end E is connected by a link EF, 300 mm **07**

long to the horizontally moving slider F.

For the mechanism in the position shown, find 1. velocity of F, 2. velocity of sliding of CE in the trunnion, and 3. angular velocity of CE.

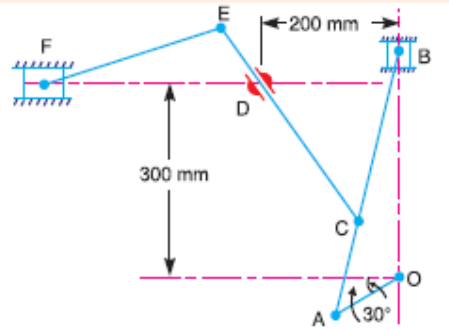


Figure 2.3

- Q.3 (a)** A single plate clutch, with both sides effective, has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm^2 . If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed 2500 rpm. **07**

- (b)** Explain in detail the following terms, **07**
a) Friction b) Limiting force of friction
c) Angle of friction d) coefficient of friction

OR

- Q.3 (a)** Derive an expression for length of cross belt drive. **07**
(b) Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 rpm. The coefficient of friction between the belt and the pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2500 N. **07**

- Q.4 (a)** Explain with neat sketch different types of Cams? What are the different types of followers used in cams? **07**
(b) A cam drives a flat reciprocating follower: during first 120° rotations of the cam, follower moves outwards through a distance of 3 cm with SHM. The follower dwells during next 90° cam rotation. During next 90° cam rotation, the follower moves outwards with uniform acceleration and deceleration. Follower dwells for the remaining cam rotation. Draw cam profile. **07**

OR

- Q.4 (a)** Construct the profile of a cam to give the following motion to the reciprocating follower with a roller follower : **07**
(i) Follower to have a stroke of 20 mm during 120° of cam rotation with uniform velocity;
(ii) Follower to dwell for 30° of cam rotation ;
(iii) Follower to return to its initial position during 120° of cam rotation with SHM; and
(iv) Follower to dwell for remaining 90° of cam rotation.
The minimum radius of the cam is 25 mm.

- (b)** List the different types of straight line mechanism and explain any one in detail. **07**

Q.5 (a) Derive an expression for the length of the arc of contact in a pair of meshed spur gears. **07**

(b) A pair of involute spur gears with 16° pressure angle and pitch of module 6 mm is in mesh. The number of teeth on pinion is 16 and its rotational speed is 240 rpm. When the gear ratio is 1.75, find in order that the interference is just avoided; 1. the addenda on pinion and gear wheel ; 2. the length of path of contact ; and 3. the maximum velocity of sliding of teeth on either side of the pitch point. **07**

OR

Q.5 (a) Classify gear trains. Give suitable application of each type of gear train. Explain with neat sketch sun and planet type gear. **07**

(b) An epicyclic gear consists of three gears A, B and C as shown in Fig. 5.1 The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C. **07**

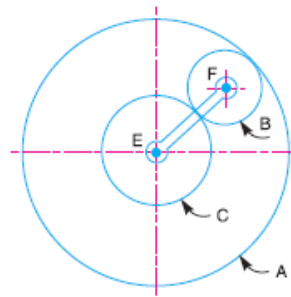


Figure 5.1
