

C.U.SHAH UNIVERSITY

Summer-2015

Subject Code: **4TE03KOM1** Subject Name: **Kinematics of Machines**

Course Name: B.Tech(Mech)

Date: 6/5/2015

Semester:III

Marks: 70

Time:2:30 TO 5:30

Instructions:

- 1) Attempt all Questions of both sections in same answer book/Supplementary.
- 2) Use of Programmable calculator & any other electronic instrument prohibited.
- 3) Instructions written on main answer book are strictly to be obeyed.
- 4) Draw neat diagrams & figures (if necessary) at right places.
- 5) Assume suitable & perfect data if needed.

SECTION-I**Q-1 Attempt the following.**

- | | | |
|-----|---|----|
| (a) | What is the function of Oldham coupling? | 02 |
| (b) | Define: Kinematic pair, Kinematic Chain. | 02 |
| (c) | What are quick return motion mechanisms? Where they are used? | 02 |
| (d) | Explain the phenomenon of creep in a belt drive. | 01 |

- | | | | |
|-----|-----|---|----|
| Q-2 | (a) | Compare chain drive with rope drive. | 04 |
| | (b) | Give classification of Kinematic pair according to type of relative motion between the elements. | 05 |
| | (c) | Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2500N. | 05 |

OR

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|-----|-----|--|----|
| Q-2 | (a) | Describe briefly Types of Constrained Motions. | 04 |
| | (b) | Derive expression for length of belt for cross belt drive. | 05 |
| | (c) | Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25 ? | 05 |

- | | | | |
|-----|-----|---|----|
| Q-3 | (a) | In Fig.1, the angular velocity of the crank OA is 600 r.p.m. Determine the linear velocity of the slider D and the angular velocity of the link BD, when the crank is inclined at an angle of 75° to the vertical. The | 07 |
|-----|-----|---|----|

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dimensions of various links are: OA = 28 mm; AB = 44 mm; BC 49 mm; and BD = 46 mm. The centre distance between the centres of rotation O and C is 65 mm. The path of travel of the slider is 11 mm below the fixed point C. The slider moves along a horizontal path and OC is vertical.

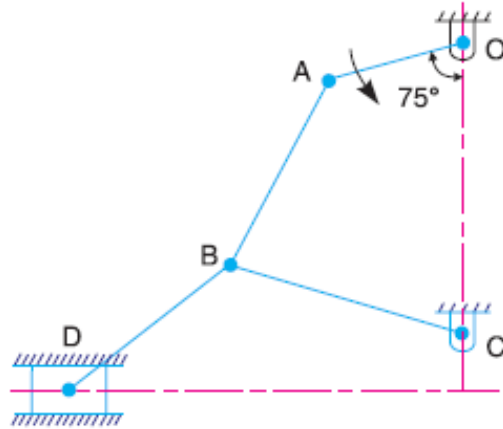


Fig. 1

- (b) Locate all the instantaneous centres of the slider crank mechanism as shown in Fig 2. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm 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

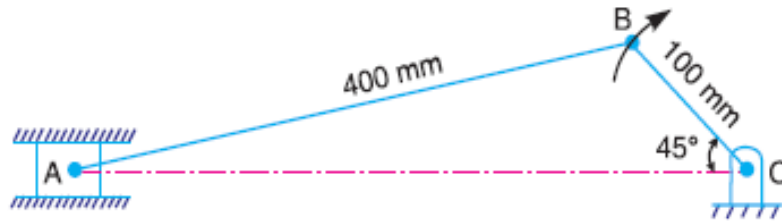


Fig. 2

OR

- Q-3 (a) Define “Inversion of Mechanism”. Draw sketches of any two inversions of Four bar Mechanism. 07
- (b) The crank of a reciprocating engine is 10 cm long and it rotates at a uniform speed of 20 rad/sec clockwise. The connecting rod length is 40cm. Determine the velocity and acceleration of the piston and angular velocity and angular acceleration of the connecting rod when crank is at 0 degree and 135 degree from IDC. Use Klein’s construction method. 07

SECTION-II

- Q-4 Attempt the following.
- | | | |
|--|--|----|
| | (a) What are the different types of motion with which a follower can move? | 02 |
| | (b) Write the difference between boundary friction and film friction. | 02 |
| | (c) Define (i) Circular Pitch (ii) Addendum | 02 |
| | (d) What do you understand by 'gear train'? | 01 |
- Q-5 (a) Classify followers and explain with neat sketch. 04
 (b) Derive the equation for maximum efficiency of screw jack. 05
 (c) Enlist different types of gear train. Explain compound gear train with neat sketch. 05
- OR
- Q-5 (a) Define the following terms related to cam. 04
 (i) Base circle
 (ii) Pitch circle
 (iii) Pressure angle
 (iv) Stroke of the follower
- (b) Differentiate between overhauling and self locking of screw. 05
 (c) Draw the displacement, velocity and acceleration diagrams for a follower when it moves with uniform acceleration and retardation. 05
- Q-6 (a) An epicyclic gear train as shown in Fig -3 has a sun wheel S of 30 teeth and two planet wheels P of 50 teeth. The planet wheel mesh with the internal teeth of a fixed annular A. The driving shaft carrying the sun wheel transmits 4 KW at 300 rpm. The driven shaft is connected to an arm which carries the planet wheel. Determine the speed of the driven shaft 07

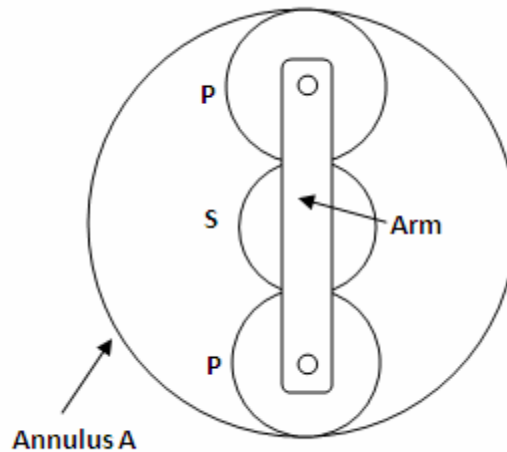


Fig. 3

- (b) Derive the expression for the frictional torque of a flat pivot bearing assuming (i) Uniform pressure theory (ii) Uniform wear theory. 07



OR

- Q-6 (a) A cam is to be designed for a knife edge follower with the following data 07
1. Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion. 2. Dwell for the next 30° . 3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion. 4. Dwell during the remaining 180° . Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft, and The radius of the base circle of the cam is 40 mm.
- (b) Explain “The common normal at the point of contact between a pair of teeth must always pass through the pitch point” 07

