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Question Paper Code: 31742

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Fourth Semester

Mechanical Engineering

01UME402 – KINEMATICS OF MACHINERY

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Differentiate between machine and structure.
2. Define: kinematic pair and kinematic chain.
3. Classify instantaneous centers.
4. What is transmission angle?
5. State the condition to avoid undercutting in cams while using roller follower.
6. Define the term trace point.
7. What are the condition and expression for maximum efficiency in spiral gears?
8. What are the different types of gears?
9. What do you mean by dry friction?
10. State the applications of multiple disc clutches.

PART - B (5 x 16 = 80 Marks)

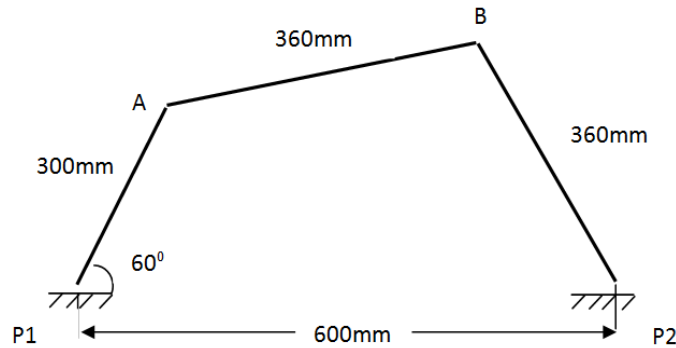
11. (a) Describe three inversions of a slider-crank mechanism with neat diagram. (16)

Or

(b) Discuss about clamping and indexing mechanisms with neat sketches. (16)

12. (a) The dimensions and configuration of the four bar mechanism, as shown in the figure. The crank P_1A has an angular velocity of 10 rad/sec and an angular acceleration of 30 rad/sec^2 , both clockwise. Determine the angular velocities and angular accelerations of P_2B and AB and velocity and Acceleration of the joint B .

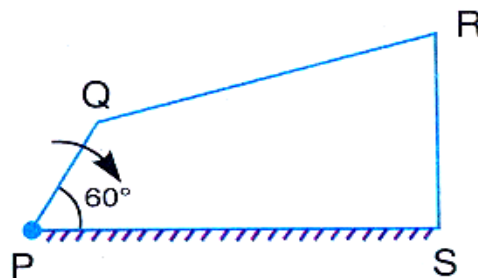
(16)



Or

(b) PQRS is a four bar chain with link PS fixed as shown in figure. The length of the links are $PQ = 62.5 \text{ mm}$; $QR = 175 \text{ mm}$; $RS = 112.5 \text{ mm}$; and $PS = 200 \text{ mm}$. The crank PQ rotates at 10 rad/s clockwise. Draw the velocity and acceleration diagram when angle $QPS = 60^\circ$ and Q and R lie on the same side of PS. Find the angular velocity and angular acceleration of the links QR and RS.

(16)



13. (a) The following data relates in a cam profile in which the follower moves with uniform acceleration and deceleration during an ascent and descent: Minimum radius of cam = 25 mm , Roller radius = 7.5 mm , Lift = 28 mm , Offset of follower axis = 12 mm towards the right, Angle of ascent = 60° , Angle of descent = 90° , angle of dwell between and Ascent and descent = 45° , Speed of the cam = 200 rpm . Draw the profile of the cam and determine the maximum velocity and uniform acceleration of the follower during the outstroke and return stroke.

(16)

Or

- (b) Construct the profile of a cam to suit the following specifications: cam shaft diameter 40mm ; least radius of cam 25mm ; diameter of roller 25mm ; angle of lift 120° ; angle of fall 150° ; lift of the follower 40mm ; number of pauses are two of equal interval between motions. During the lift, the motion is S.H.M. During the fall, the motion is U.A.U.R. The speed of the cam shaft is uniform. The line of stroke of the follower is offset by 12.5mm from the center of the cam. (16)
14. (a) Two 20° involute spur gears have a module of 10 mm . The addendum is one module. The larger gear has 50 teeth and pinion 13 teeth. Does the interference occur? If it occurs, to what value should the pressure angle be changed to eliminate interference. (16)

Or

- (b) The following data relate to a pair of 20° involute gears in mesh. Module = 6 mm , Number of teeth on pinion = 17, Number of teeth on gear = 49, Addenda on pinion and gear wheel = 1 module. Find 1. The number of pairs of teeth in contact 2. The angle turned through by the pinion and the gear wheel when one pair of teeth in contact and 3. The ratio of sliding to rolling motion when the tip of a tooth on the larger wheel.
- (i) is just making contact
 - (ii) is just leaving contact with its mating tooth and
 - (iii) is at the pitch point. (16)
15. (a) A load of 15 kN is raised by means of a screw jack. The mean diameter of the square threaded screw is 42 mm and the pitch is 10 mm . A force of 120 N is applied at the end of a lever to raise the load. Determine the length of the lever to be used and the mechanical advantage obtained. Is the screw self locking? Take $\mu = 0.12$. (16)

Or

- (b) A plate clutch has three discs on the driving shaft and two discs on the driven shaft, providing four pairs of contact surfaces. The outside diameter of the contact surfaces is 240 mm and inside diameter 120 mm . Assuming uniform pressure and Coefficient of friction is 0.3. Find the total spring load pressing the plates together to transmit 25 kW at 1575 rpm . If there are 6 springs, each of stiffness 13 kN/m and each of the contact surfaces has worn away by 1.25 mm , find the maximum power that can be transmitted, assuming uniform wear. (16)

