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Question Paper Code: 31472

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2016

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 illustrate any two types of constrained pair.
3. What is transmission angle?
4. What do you mean by the term coincident points?
5. Define (a) pressure angle (b) pitch curve of radial cam.
6. Define the term trace point.
7. What are the different types of gears?
8. What are overhauling and self – locking in screws?
9. Give the condition for maximum efficiency of a screw jack.
10. What are the engineering applications of belt and rope drives?

PART - B (5 x 16 = 80 Marks)

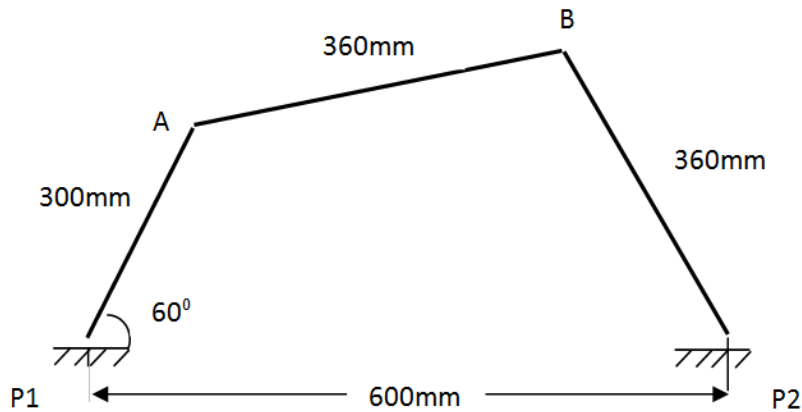
11. (a) Briefly explain the following inversions (i) beam engine (ii) elliptical trammels (iii) crank and slotted lever quick return mechanism. (16)

Or

(b) (i) Describe the peaucellier mechanism with neat sketch. (6)

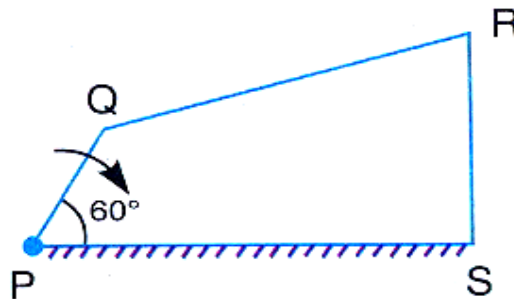
(ii) Summarize the different kinds of kinematic pairs with examples. (10)

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) 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 UAUUR. 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)

Or

- (b) A symmetrical circular cam operating a flat faced follower has the following particulars: minimum radius of the cam 30 mm ; total lift 20 mm ; angle of lift 75° ; Nose radius 5 mm ; speed 600 rpm . Find the principal dimensions 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) Two shafts A and B are co-axial. A gear C (50 teeth) 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 r.p.m. , find the speed of shaft B . (16)
15. (a) (i) A pulley is driven by a flat belt, the angle of lap being 120° . The belt is 100 mm wide by 6 mm thick and density 1000 Kg/m^3 . If the coefficient of friction is 0.3 and the maximum stress in the belt is not to exceed 2 MPa , find the greatest power which the belt can transmit and the corresponding speed of the belt. (10)
- (ii) Derive an expression for braking torque on the drum of simple band brake. (6)

Or

- (b) (i) A single-plate clutch transmits 25 kW at 900 rpm . The maximum pressure intensity between the plates is 85 kN/m^2 . The outer diameter of the plate is 360 mm . Both the sides of the plate are effective and the coefficient of friction is 0.25. Determine (i) The inner diameter of the plate (ii) The axial force to engage the clutch. (8)
- (ii) What is a clutch? Make a sketch of a single plate clutch and describe its working. (8)

