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Question Paper Code: 54702

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2019

Fourth Semester

Mechanical Engineering

15UME402 – KINEMATICS OF MACHINERY

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A kinematic chain is known as a mechanism when CO1- R
(a) None of the link is fixed (b) One of the links is fixed
(c) Two of the links are fixed (d) All of the links are fixed
2. The mechanism forms a structure, when the number of degrees of freedom(n) is equal to CO1- R
(a) 0 (b) 1 (c) 2 (d) -1
3. The direction of linear velocity of any point on a link with respect to another point on the same link is CO2- R
(a) Parallel to the link joining the points (b) At 60° to the link joining the points
(c) At 45° to the link joining the points (d) At 90° to the link joining the points
4. The component of the acceleration , perpendicular to the velocity of the particle , at the given instant is called as CO2- R
(a) Radial component (b) Acceleration
(c) Tangential component (d) None of these
5. The size of a cam depends upon CO3- R
(a) Base circle (b) Pitch circle (c) Prime circle (d) Pitch curve
6. The cam follower generally used in automobile engines is CO3- R
(a) Knife edge follower (b) Flat faced follower
(c) Spherical faced follower (d) Roller follower

7. The two parallel and coplanar shafts are connected by gears having teeth parallel to the axis of the shaft. This arrangement is called CO4- R
- (a) Spur gearing. (b) Helical gearing. (c) Bevel gearing (d) Spiral gearing
8. The contact ratio for gears is CO4- R
- (a) Zero (b) Less than one (c) Greater than one (d) Equal to one
9. When the axes of first and last gear are co-axial, then gear train is known as CO5- R
- (a) Simple gear train. (b) Compound gear train.
(c) Reverted gear train. (d) Epicyclic gear train.
10. What type of gear train is used in watches CO5- R
- (a) Simple gear train (b) Epi cycle gear train
(c) Reverted gear train (d) Compound gear train

PART – B (5 x 2= 10 Marks)

11. What is a kinematic chain? CO1- R
12. What are the two components of acceleration? CO2- R
13. Why a roller follower is preferred to a knife-edged follower? CO3- R
14. Define module of a gear. CO4- R
15. How epicyclic gear train differs from the other types of gear train? CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) Sketch the double slider crank chain and its inversions. Explain the working of Oldham coupling. CO1- U (16)
- Or
- (b) (i) Distinguish between a mechanism and a machine. CO1- U (8)
- (ii) Explain with simple sketches the different types of kinematic pairs. CO1- U (8)
17. (a) In a slider crank chain, the crank CB 100 mm long revolves at a speed of 75 rad/s and an angular acceleration of 1200 rad/s² in clockwise direction. The connecting rod AB is 300 mm long. Find the velocity and acceleration of a point G on AB at a distance of 120 mm from when B the crank makes 135° with IDC. Also find the angular velocity and angular acceleration of AB. CO2- Ana (16)

Or

- (b) ABCD is a four bar chain with link AD fixed. The length of the links are AB=62.5 mm; BC=175 mm; CD=112.5 mm; and AD=200 mm. The crank AB rotates 10 rad/s clockwise. Draw the velocity diagram when angle BAD=60° and B and C lie on the same side of AD. Find the angular velocity of links BC and CD. CO2- Ana (16)
18. (a) Draw the profile of a cam with oscillating roller follower for the following motion: CO3- App (16)
- (a) Follower to move outwards through an angular displacement of 20° during 120° of cam rotation.
- (b) Follower to dwell for 55° of cam rotation.
- (c) Follower to return to its initial position in 90° of cam rotation with uniform acceleration and retardation.
- (d) Follower to dwell for the remaining period of cam rotation. The distance between the pivot centre and the roller centre is 68 mm. The minimum radius of the cam is 42 mm and the diameter of the roller is 26 mm.

Or

- (b) Draw the profile of a cam operating a roller reciprocating follower with following data: Minimum radius of the cam=26mm, Lift=30mm, Roller diameter=15 mm. The cam lifts the follower for 120° with SHM followed by a dwell period of 30°. Then follower lowers down during 150° of the cam rotation with uniform acceleration and retardation followed by a period of dwell. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration during ascent. CO3- App (16)
19. (a) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio. CO4- App (16)

Or

- (b) Two gears of 20° pressure angle and module 4 mm have 30 and 48 teeth. The addendum is 4 mm for both gears. Calculate the contact ratio; if the pitch line speed is 628.32 mm/s, calculate the maximum velocity of sliding. CO4- App (16)

20. (a) In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B? CO5- App (16)

Or

- (b) In a reverted epicycle gear train, the arm A carries two gears B and C and a compound gear D-E. The gear B meshes with gear E and the gear C meshes with gear B. The number of teeth on gears B,C and D are 75,30 and 90 respectively. Find the speed and direction of gear C. When gear B is fixed and the arm A makes 100rpm clockwise. CO5- App (16)