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Question Paper Code:53A05

B.E./B.Tech. DEGREE EXAMINATION, NOV 2018

Third Semester

Agricultural Engineering

15UAG305 - FUNDAMENTALS OF THEORY OF MACHINES

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A combination of key pairs, joined in such a way that the relative motion between the links is completely constrained, is called a _____. CO1- R
(a) Structure (b) Mechanism (c) Kinematic chain (d) Inversion
2. Which of the following is an inversion of double slider crank chain ____ CO1- R
(a) Coupling rod of a locomotive (b) Pendulum pump
(c) Elliptical trammels (d) Oscillating cylinder engine
3. When a slider moves on a fixed link having curved surface, their instantaneous centre lies _____. CO2- R
(a) On their point of contact (b) At the centre of curvature
(c) At the centre of circle (d) At the pin joint
4. The Coriolis component of acceleration is taken into account for _____. CO2- R
(a) Slider crank mechanism (b) Four bar chain mechanism
(c) Quick return motion mechanism (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. Offset is provided to a cam follower mechanism to _____. CO3- R
 (a) Minimize the side thrust (b) Accelerate
 (c) Avoid jerk (d) None of these
7. The type of gear used to connect two non-parallel non intersecting shafts are _____. CO4- R
 (a) Spur gears (b) Helical gears (c) Spiral gears (d) None of these
8. The contact ratio for gears is CO4- R
 (a) ZERO (b) Less than one (c) Greater than one (d) None of these
9. When the axes of first and last gear are coaxial, then the gear train is known as CO5- R
 (a) Simple gear train (b) Compound gear train
 (c) Reverted gear train (d) Epicyclic gear train
10. A differential gear in an automobile is a _____. CO5- R
 (a) Simple gear train (b) Epicyclic gear train
 (c) Compound gear train (d) None of these

PART – B (5 x 2= 10 Marks)

11. Explain Kinematic Pair. CO1- R
12. What are the methods for determining the velocity of a point on a link? CO2- U
13. Classify the Followers used in cams. CO3- U
14. List the advantages of gear drive. CO4- R
15. What is meant by gear train and list its types. CO5- U

PART – C (5 x 16= 80Marks)

16. (a) Describe the three inversions of a four bar chain with neat sketches. CO1- U (16)

Or

- (b) Describe various inversions of double slider crank mechanism with sketches. CO1- U (16)

17. (a) In a four bar chain ABCD, AD is fixed and is 150mm long. The crank AB is 40mm long and rotates at 120 r.p.m. clockwise, while the link CD=80mm oscillates about D, BC and AD are of equal length. Find the angular velocity of the link CD when angle BAD=60°. CO2- App (16)

Or

- (b) PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ=62.5mm; QR=175mm; RS=112.5mm; and PS=200mm. the crank PQ rotates at 10rad/s clockwise. Draw the velocity and acceleration diagram when angle QPS=60° and Q and R lie on the same side of PS. Find the angular velocity and angular acceleration of links QR and RS. CO2- App (16)
18. (a) A cam is to be designed for a knife edge follower with following data Cam lift = 40mm during 90° of cam rotation with SHM, dwell for next 30°, during the next 60° the follower returns to its original position with SHM, dwell during remaining 180°. Draw the profile of the cam when the line of stroke is offset 20 mm from the axis of the cam shaft. The radius of base circle of cam is 40mm. CO3- App (16)

Or

- (b) A cam drives a flat reciprocating follower in the following manner: during first 120° rotation of the cam, follower moves outwards through a distance of 20mm with simple harmonic motion. The follower dwells during next 30° of cam rotation. During next 120° of cam rotation, the follower dwells during next 90° of cam rotation. The minimum radius of the cam is 25mm. Draw the profile of the cam. CO3- App (16)
19. (a) Draw the gear and describe about its nomenclature in detail. CO4- U (16)

Or

- (b) Determine the minimum number of teeth required on a pinion, in order to avoid interference which is to gear with 1.a wheel to give a gear ratio of 3 to 1; and 2.an equal wheel. The pressure angle is 20 ° and a standard addendum of one module for the wheel may be assumed. 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 clock wise direction, what will be the speed of gear B. CO5- App (16)

Or

- (b) Two parallel shafts, about 600mm apart are to be connected by spur gears. One shaft is to run at 360 r.p.m. and the other at 120 r.p.m. design the gears, if the circular pitch is to be 25mm. CO5- App (16)