KUMARAGURU
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Register Number:………….

B.E DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2013)

Third Semester

MECHATRONICS ENGINEERING

U13MCT302: Kinematics of Machinery

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. When one of the links of a kinematic chain is fixed, the chain in known as
    a) Mechanism   b) Closed link
    c) Structure   d) Machine

2. A ball and a socket joint forms a _____

3. The corio lis component of acceleration is taken into account for
    a) Slider crank mechanism   b) Quick return mechanism
    c) Four bar mechanism   d) Tumbler mechanism

4. The component of acceleration, parallel to the velocity of the particle, at the given instant is called _____

5. The size of cam depends upon
    a) Base circle   b) Pitch circle
    c) Prime circle   d) Pitch curve

6. Offset is provided to the cam follower mechanism to _____

7. The contact ratio for gears is
    a) zero   b) Less than one
    c) Equal to one   d) Greater than one

8. The differential gear in an automobile is an _____ gear train

9. Due to slip of the belt, the velocity ratio of the belt drive
    a) Decreases   b) Increases
    c) Becomes zero   d) Remains same

10. The centrifugal tension in belts have _____ effect on power transmitted

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. What is degree of freedom?

12. Define mechanical advantage.

13. What are coincident points?

14. Establish the relationship between radial velocity and radial acceleration.

15. Classify cams

16. Define undercutting in cams

17. State the law of gearing

18. How gears are Classified?

19. What is the effect of friction?

20. List the functions of a clutch.

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21.   A Cam is to be designed for a knife edge follower with the following data:

1. Cam life = 40mm during 90° of cam rotation with simple harmonic motion.

2. Dwell for next 30°

3. During the next 60° of cam rotation, the follower returns to its original position with SHM

4. Dwell during the remaining rotation.

Draw the profile of the cam when the line of the stroke of the follower passes through the axis of the cam. The radius of the base circle of the cam is 40mm. determine the maximum velocity and acceleration of the follower, if the cam rotates at 240 rpm.

22. a) (i) Define inversion of mechanism. (4)

       (ii) Explain the various inversion of four bar chain with neat sketches. (10)

(OR)

   b) (i) Explain any two inversion of Single slider crank chain with neat sketches. (7)

       (ii) Explain any two inversion of Double slider crank chain with neat sketches. (7)

23. a) The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 rpm. The crank is 150mm and the connecting rod is 600 mm long. Determine i) the linear velocity and acceleration at the mid-point of the connecting rod ii) angular velocity and angular acceleration of the connecting rod at a crank angle of 45° from the IDC position.

(OR)

b) PQRS is a four bar chain with link PS fixed. The lengths of the link are PQ=62.5mm, QR=175mm, RS=112.5mm and PS=200mm. the crank PQ rotates at 10 rad/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 QS.

24. a) A pair of gears, having 40 and 20 teeth respectively, is rotating in mesh, the speed of the smaller being 2000 rpm. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point, and the point of disengagement if the smaller gear is the drive. Assume the gear teeth as 20° involute form, addendum length is 5mm and the module is 5mm.

(OR)

b) (i) Explain the working of the differential gear of an automobile with a neat sketch. (7)

(ii) What is a gear train? Describe the various types of gear trains with simple sketches. (7)

25. a) (i) Explain the following terms (4)

   a) Slip of the belt   b) Creep of the belt

(ii) Derive an expression for the length of the cross belt drive in terms of pulley diameter. (10)

(OR)

b) (i) List the advantages and disadvantages of chain drives over belt drives. (4)

(ii) What are friction clutches? Explain the working of a single plate clutch with a neat diagram. (10)

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