Question Paper Code: 44072

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

Fourth Semester

Mechanical Engineering

14UME402 - KINEMATICS OF MACHINERY

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A simple mechanism has

    (a) 1 link   (b) 2 link   (c) 3 link   (d) 4 link

2. ABCD is a mechanism with link lengths AB=200, BC=300, CD=400 and DA=350. Which one of the following links should be fixed for the resulting mechanism to be a double crank mechanism? (All lengths are in mm)

    (a) AB   (b) BC   (c) CD   (d) DA

3. Inertia force acts

    (a) Perpendicular to the accelerating force
    (b) Along the direction of acceleration force
    (c) Opposite to the direction of acceleration force
    (d) In any direction w.r.t accelerating force depending on the magnitude of two

4. The total number of instantaneous centres for a mechanism consisting of *n* links are

    (a) n/2   (b) n   (c) (n-1)/2   (d) [n(n-1)]/2

5. The cam follower extensively used in air-craft engines is

    (a) Knife edge follower   (b) Flat faced follower

    (c) Spherical faced follower   (d) Roller follower

6. Cam size depends on

    (a) Base circle   (b) Pitch circle

    (c) Prime circle   (d) Outer circle

7. A gear having 100 teeth is fixed and another gear having 25 teeth revolves around it, centre lines of both the gears being jointed by an arm. How many revolutions will be made by the gear of 25 teeth for one revolution of arm?

    (a) 3   (b) 4   (c) 5   (d) 6

8. A differential gear in an automobile is a

    (a) Simple gear train   (b) Compound gear train

    (c) Epicyclic gear train   (d) None of these

9. Which of the following clutches is positive type

    (a) Cone   (b) Disc   (c) Jaw   (d) Centrifugal

10. The frictional torque transmitted by a disc or plate clutch is same as that of

    (a)Flat pivot bearing   (b)Flat collor bearing

    (c)Conical pivot bearing   (d) Trapezoidal pivot bearing

PART - B (5 x 2 = 10 Marks)

11. Differentiate between a mechanism and a structure.

12. What is the expression for Corioli's component of acceleration?

13. What are the types of follower motion?

14. State the law of gearing.

15. Write four applications of band brakes.

PART - C (5 x 16 = 80 Marks)

16. (a) What are quick-return mechanisms? Where are they used? Discuss the functioning of any one of them. (16)

(b) With a neat sketch explain any inversions of double slider crank chain. (16)

17. (a) Figure shows configuration of an engine mechanism. The dimensions are, crank *OA* = 200 *mm*, connecting rod *AB* = 600*mm*, distance of center of mass of the connecting rod from crank end *AD* = 200 *mm*. At the instant, the crank has an angular velocity of 50 *rad/s* clockwise and an angular acceleration of 800 *rad/ s²*, calculate the (i) velocity of *D* and angular velocity of *AB* (ii) acceleration of *D* and angular acceleration of *AB*. (16)
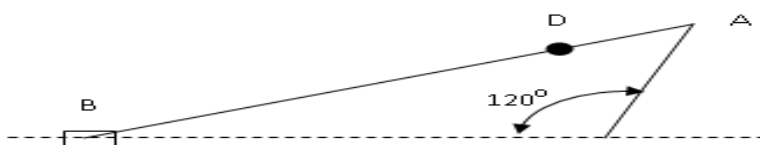

Or

(b) The Crank of a slider crank mechanisms rotates clockwise at a Constant speed of 300 rpm. The crank is 150 mm and connecting rod is 600 mm long. Determine 1. Linear velocity and acceleration of the mid Point of the connecting rod, and 2. Angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre position. (16)

18. (a) 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 20 mm with simple harmonic motion. The follower dwells during next 30° of cam rotation. During next 120° of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next 90° of cam rotation. The minimum radius of the cam is 25 mm. Draw the profile of the cam. (16)

Or

(b) A cam with a minimum radius of 25 *mm* is to be designed for a knife-edge follower with the following data:

    (i) To raise the follower through 35 *mm* during 60° rotation of the cam

    (ii) Dwell for next 40° of the cam rotation

    (iii) Descending of the follower during next 90° of the cam rotation

    (iv) Dwell during the rest of the cam rotation

44072

Draw the profile of the cam if the ascending and descending of the cam is with simple harmonic motion and the line of stroke of the follower is offset 10 *mm* from the axis of the cam shaft. What is the maximum velocity and acceleration of the follower during the ascent and the descent if the cam rotates at 150 *rpm*. (16)

19. (a) An epicyclic gear train is shown in figure. The number of teeth on *A* and *B* are 80 and 200. Determine the speed of the arm *a*.

    (i) If *A* rotates at 100 *rpm* clockwise and *B* at 50 *rpm* counter clockwise

    (ii) If *A* rotates at 100 *rpm* clockwise and *B* is stationary (16)
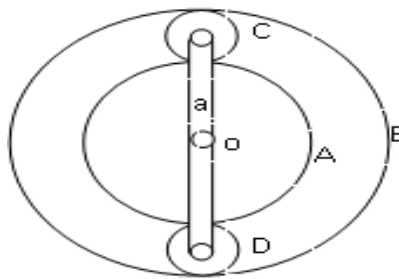
Or

(b) The number of teeth on each of the two spur gears in mesh is 40. The teeth have 20° involute profile and the module is 6mm. If the arc of contact is 1.75 times the circular pitch. Find the addendum. (16)

20. (a) A single dry plate clutch transmits 7.5 kW at 900 r.p.m. The axial pressure is limited to 0.07 N/mm2. If the coefficient of friction is 0.25, find (i). Mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4, and (ii). Outer and inner radii of the clutch plate. (16)

Or

(b) Determine the width of a 9.75 *mm* thick leather belt required to transmit 15 *kW* from a motor running at 900 *rpm*. The diameter of the driving pulley of the motor is 300 *mm*. The driven pulley runs at 300 *rpm* and the distance between the centre of two pulleys is 3 *m*. The density of the leather is 1000 *kg/m³*. The maximum allowable stress in the leather is 2.5 *MPa*. The coefficient of friction between the leather and pulley is 0.3. Assume open belt drive and neglect the sag and slip of the belt. (16)

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44072