KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Fourth Semester

MECHANICAL ENGINEERING

U13MET404: Kinematics Of Machinery

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. In a kinematic chain, a quaternary joint is equivalent to

    a) One binary joints   b) Two binary joints

    c) Three binary joints   d) Four binary joints

2. The mechanism forms a structure, when the number of degrees of freedom (n) is equal to …………..

3. According to Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centers will lie on a

    a) Parabolic curve   b) Straight line

    c) ellipse   d) hyperbolic

4. The angular velocity (in rad/s) of a body rotating at N rpm is……………..

5. The cam follower extensively used in air craft engine is

    a) Knife edge follower   b) Flat faced follower

    c) Spherical faced follower   d) Roller follower

6. The size of the cam depends upon……………..

7. A differential gear in automobiles is used to

    a) Reduce speed   b) Assist in changing speed

    c) Provide jerk-free movement   d) Help in turning

8. The size of a gear is usually specified by……………..

9. Friction present in a screw thread is_____

    a) Rolling friction   b) Sliding friction

    c) Running friction   d) Zero friction

10. During braking kinetic energy of moving vehicle is converted into_____

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. State clearly the expression of Gruebler's criterion for plane mechanism.

12. Give an engineering brief on indexing mechanism.

13. Define rubbing velocity at a pin joint.

14. Enlist the properties of instantaneous center.

15. Classify the types of follower based on the surface in contact and motion of path.

16. Specify the design consideration for a high speed cam.

17. Classify the types of gear train based on arrangement of wheels.

18. State the law of toothed gearing.

19. Mention the conditions to be satisfied for design a friction clutch.

20. State the important factors to be considered in selection of belt drive.

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 lift =50mm during 90° of cam rotation with simple harmonic motion 2)dwell for the next 45° 3)During next 90°of cam rotation the follower returns to its original position with simple harmonic motion and dwell for the remaining period. Determine the maximum velocity and acceleration during out stroke and return stroke if the cam rotates at 1000 rpm in clockwise direction also draw the cam profile and displacement diagram.

22. a) (i)   What are the types of kinematic chain?   (2)

    (ii) Exemplify in detail the kinematic inversion of four bar chain for any two commercial applications.   (12)

(OR)

    b) (i)   Explain Scott Russell straight line generator Mechanism with neat sketch   (6)

    (ii) Discuss in detail about the ratchets and escapements mechanism with illustrative sketch   (8)

23. a) A four bar mechanism has the following dimensions :

DA = 300 mm; CB = AB = 360 mm; DC = 600 mm. The link DC is fixed and the angle ADC is 60°. The driving link DA rotates uniformly at a speed of 100 rpm clockwise and the constant driving torque has the magnitude of 50 N-m. Determine the velocity of the point B and angular velocity of the driven link CB

(OR)

b) In a pin jointed four bar mechanism, as shown in Figure, AB = 300 mm, BC = CD = 360 mm, and AD = 600 mm. The angle BAD = 60°. The crank AB rotates uniformly at 100 rpm. Locate all the instantaneous centers and find the angular velocity of the link BC.
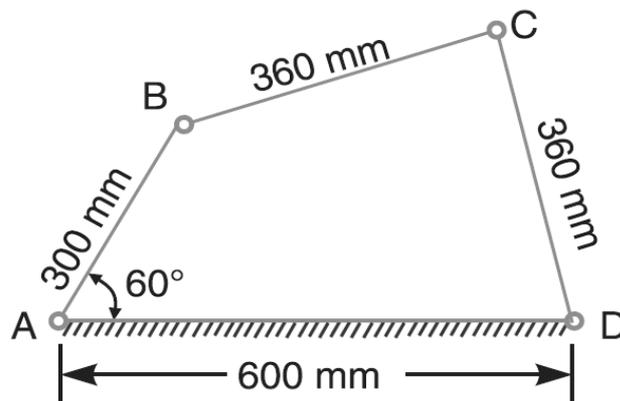
24. a) (i) Compare involute gears with cycloid gears in terms of commercial usage. (6)

(ii) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears (8) 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.

(OR)

b) An epicyclic gear consists of three gears A, B and C. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C.

25. a) (i) An electric motor driven power screw moves a nut in a horizontal plane against (8) a force of 75 kN at a speed of 300 mm/min. the screw has a single square thread of 6 mm pitch on a major diameter of 40 mm the coefficient at the screw threads is 0.1. Estimate the power of motor.

(ii) Determine the maximum, minimum and average pressure in plate clutch when (6)

the axial force is 4 kN. The inside radius of the contact surface is 50 mm and the outside radius is 100 mm. Assume uniform wear.

(OR)

b)   A shaft which rotates at a constant speed of 160 rpm. is connected by belting to a parallel shaft 720 mm apart, which has to run at 60, 80 and 100 rpm. The smallest pulley on the driving shaft is 40 mm in radius. Determine the remaining radii of the two stepped pulleys for 1) a crossed belt and 2) an open belt. (Neglect belt thickness and slip)

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