Reg. No. : | | | | | | | | | | |

Question Paper Code: 31742

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Fourth Semester

Mechanical Engineering

01UME402 – KINEMATICS OF MACHINERY

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Define kinematic link, and a kinematic chain.
2. What is mechanical advantage for a mechanism?
3. What is rubbing velocity and how this is determined?
4. Define instantaneous centre.
5. What is a tangent cam?
6. What is an offset follower?
7. Define (i) Module and (ii) Pressure angle.
8. What are differences between simple, compound, and epicyclic gear trains?
9. What is centrifugal tension in a belt? How does it affect the power transmitted?
10. What is (i) Limiting friction and (ii) Angle of friction?

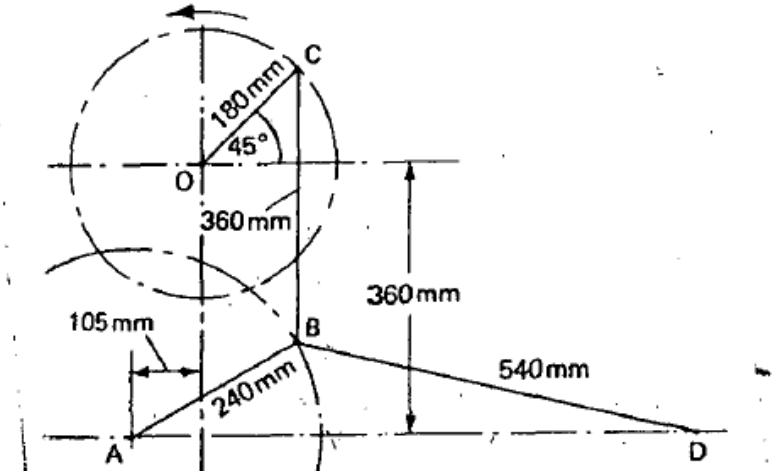
PART - B (5 x 16 = 80 Marks)

11. (a) Define transmission angle. Sketch a drag-link mechanism in maximum transmission angle and minimum transmission angle positions and explain. (16)

Or

(b) Sketch and explain any three kinematic inversion of four bar chain. (16)

12. (a) In the mechanism shown below, D is constrained to move on a horizontal path. Find, for the given configuration, the velocity and acceleration of D and the angular velocity and acceleration of BD when OC is rotating in an anticlockwise direction at a speed of 180 rev/min increasing at the rate of 50 rad/s^2. (16)



Or

(b) An engine mechanism is shown in Fig. below. The crank CB = 100 mm and the connecting rod BA = 300 mm with centre of gravity G, 100 mm from B. In the position shown, the crankshaft has a speed of 75 rad/s and an angular acceleration of 1200 rad/s2. Find:1. Velocity of G and angular velocity of AB, and 2. Acceleration of G and angular acceleration of AB. (16)

13. (a) Construct the profile of a cam to suit the following specifications: cam shaft diameter 40*mm*; least radius of cam 25*mm*; diameter of roller 25*mm*; angle of lift 120°; angle of fall 150°; lift of the follower 40*mm*; number of pauses are two of equal interval between motions. During the lift, the motion is S.H.M. During the fall, the motion is UAUR. The speed of the cam shaft is uniform. The line of stroke of the follower is offset by 12.5*mm* from the center of the cam. (16)

Or

(b) A cam rotating clockwise at a uniform speed of 1000 r.p.m. is required to give a roller follower the motion defined below:

- Follower to move outwards through 50 mm during 120° of cam rotation,
- Follower to dwell for next 60° of cam rotation,
- Follower to return to its starting position during next 90° of cam rotation,
- Follower to dwell for the rest of the cam rotation.

The minimum radius of the cam is 50 mm and the diameter of roller is 10 mm. The line of stroke of the follower is off-set by 20 mm from the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and retardation on both the outward and return strokes, draw profile of the cam and find the maximum velocity and acceleration during out stroke and return stroke. (16)

14. (a) A pair of gears, having 40 and 20 teeth respectively, are rotating in mesh, the speed of the smaller being 2000 r.p.m. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point, and at the point of disengagement if the smaller gear is the driver. Assume that the gear teeth are 20° involute form, addendum length is 5 mm and the module is 5 mm. Also find the angle through which the pinion turns while any pairs of teeth are in contact. (16)

Or

(b) Two shafts A and B are co-axial. A gear C (50 teeth) is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 r.p.m., find the speed of shaft B. (16)

15. (a) Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25? (16)

Or

(b) A conical pivot bearing supports a vertical shaft of 200 mm diameter. It is subjected to a load of 30 kN. The angle of the cone is 120° and the coefficient of friction is 0.025. Find the power lost in friction when the speed is 140 r.p.m., assuming (i) Uniform pressure; and (ii) Uniform wear. (16)

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