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B.E./B.TECH. DEGREE EXAMINATIONS , MAY 2024

Fourth Semester

ME16401 – KINEMATICS OF MACHINERY

(Mechanical Engineering)

(Regulation 2016)

Time: 3 Hours **Maximum: 100 Marks**

Answer **ALL** questions

PART A - (10 X 2 = 20 marks)

1. Enumerate the difference between Machine-Mechanism and Machine-Structure.
2. Elaborate about the joint which is found in transmission from gear box to differential and are used for transmission of power.
3. How will you determine the magnitude and direction of Coriolis component of acceleration?
4. What are the expression for radial and tangential component of acceleration?
5. What are the necessary elements of a cam mechanism?
6. State the expressions for maximum velocity and acceleration of a follower moves with Cycloidal motion.
7. State law of gearing.
8. What is reverted gear train? List the applications of epicyclic gear train.
9. What are the factors to be considered when designing a disc or plate clutch?
10. List out any four desirable characteristics of brake lining material.

PART B - (5X16 = 80 marks)

11.(a) Explain the inversions of any three double slider crank mechanism with neat sketches. **(16)**

(OR)

(b) What is meant by Quick return mechanism. Explain the types with a neat sketch **(16)**

12.(a) In a slider crank mechanism, the length of crank OB & connecting rod AB are 125 mm & 500 mm respectively. The center of gravity G of the connecting rod is 275 mm from the slider A. The crank speed is 600 r.p.m. clockwise. When crank has turned 45° from the inner dead center position, Determine: 1.velocity of the slider A, 2. velocity of the point G, and 3. angular velocity of the connecting rod AB **(16)**

(OR)

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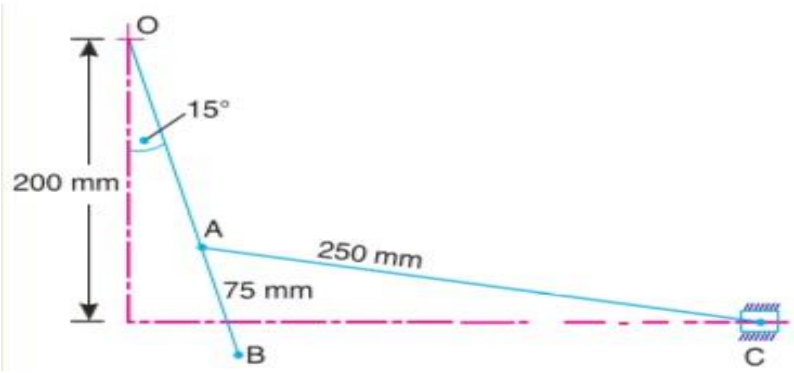
(b) The oscillating link OAB of a mechanism, is shown below. It is pivoted at O and is moving at 90 r.p.m. anticlockwise. If OA = 150 mm ; AB = 75 mm, and AC = 250 mm, calculate 1.the velocity of the block C; 2. the angular velocity of the link AC; and 3. the rubbing velocities of the pins at O, A and C, assuming that these pins are of equal diameters of 20 mm **(16)**



13.(a) Draw the profile of a disc cam to give uniform motion and uniform velocity during outstroke of 25 mm to a knife edge follower during first half revolution. Return of cam is also of similar uniform motion with uniform velocity during remaining half revolution. Minimum radius of the cam is 25 mm. Assume that the axis of knife edge follower passes through cam axis. **(16)**

(OR)

(b) From the following data draw the profile of a cam in which the follower moves with SHM during ascent while it moves with uniformly accelerated and decelerated motion during descent. Least radius of the cam = 50 mm; Angle of ascent = 48°; Angle of dwell= 42°; Angle of descent= 60°; Lift of the follower= 40 mm; Diameter of the roller= 30 mm. If the cam rotates at 360 rpm anticlockwise find the maximum velocity and acceleration of the follower during descent. **(16)**

14.(a) Two spur gears of 28 teeth and 34 teeth of 6 mm module and 20° pressure angle are in mesh. Addendum of each gear is 7.5 mm. The teeth are of involute form. Determine: 1. the angle through which the pinion turns while any pair of teeth are in contact, and 2. the velocity of sliding between the teeth when the contact on the pinion is at a radius of 100 mm. The speed of the pinion is 600 r.p.m. **(16)**

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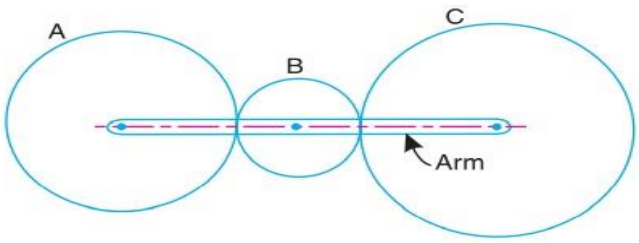
(OR)

(b) In an epicyclic gear train, as shown in Fig, the number of teeth on wheels A, B and C are 48, 24 and 50 respectively. If the arm rotates at 400 r.p.m., clockwise, find : 1. Speed of wheel C when A is fixed, and 2. Speed of wheel A when C is fixed **(16)**



15.(a) **(i)** A bolt with a square threaded screw has mean diameter of 25 mm and a pitch of 3 mm. It carries an axial thrust of 10 kN on the bolt head of 25 mm mean radius. If μ = 0.12, find the force required at the end of a spanner 450 mm long, in tightening up the bolt **(8)**

(ii) 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 120º and the coefficient of friction is 0.025. Find the power lost in friction when the speed is 140 r.p.m., assuming 1. uniform pressure; and 2. uniform wear. **(8)**

(OR)

(b) **(i)** A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 r.p.m. Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm2. Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear **(8)**

(ii) An open belt 100 mm wide connects two pulleys mounted on parallel shafts with their centres 2.4 m apart. The diameter of the larger pulley is 450 mm and that of the smaller pulley 300 mm. The coefficient of friction between the belt and the pulley is 0.3 and the maximum stress in the belt is limited to 14 N/mm width. If the larger pulley rotates at 120 r.p.m., find the maximum power that can be transmitted. **(8)**

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