

B.E. / B.TECH. DEGREE EXAMINATIONS, December 2020

Fourth Semester

ME 16401 – KINEMATICS OF MACHINERY**(Regulation 2016)****Time: Three Hours****Maximum : 80 Marks**Answer **ALL** questions**PART A - (8 X 2 = 16 Marks)**

1. In a crank and slotted lever quick-return motion, the distance between the fixed centres is 150 mm and the length of the driving crank is 75mm. the ratio of the time taken on the cutting and return strokes is
1.5 b) 2.0 c) 2.2 d) 2.93
2. The number of inversions of a slider crank chain is
a) 6 b) 5 c) 4 d) 3
3. ABCD is a four bar mechanism in which AB = 310mm and CD = 450mm. AB and CD are both perpendicular to the fixed link AD. If the velocity of B at this condition is v. Then the velocity of C is
a) v b) $\frac{2}{3}v$ c) $\frac{3}{2}v$ d) $\frac{9}{4}v$
4. When a particle moves along a straight path, then the particle has
a) tangential acceleration only
b) centripetal acceleration only
c) both tangential and centripetal acceleration
d) none of the mentioned
5. Analyse the radial follower over off set follower
6. Describe undercutting in cam. How it occurs? How can you prevent undercutting in cam?
7. Compare epicyclic gear train with other gear trains and In what way it is differ from other trains
8. Explain the term 'interference of gears'

PART B - (4 X16 = 64 Marks)

- 9 (a) Explain the working of two different types of quick return mechanisms. Derive an expression (16)
for the ratio of time taken in forward and return stroke for one of these mechanisms

(OR)

- (b) (i) What is degree of freedom of a mechanism? How is it determined? Define Grashof's law. (8)
State how is it helpful in classifying the four link mechanisms into different types?
- (ii) State the significance and applications of Oldham's coupling. (8)
10. (a) The Crank of a slider crank mechanisms rotates clockwise at a Constant speed of 600 r.p.m. The (16)
crank is 125 mm and connecting rod is 500 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

(OR)

- (b) In a four bar chain ABCD, AD is fixed and is 120 mm long. The crank AB is 30 mm long and rotates at 100 rpm clockwise while the link CD = 60 mm oscillates about D; BC = 120 mm. Using graphical method, find the angular velocity and angular acceleration of link BC when angle BAD = 60°. **(16)**

11. (a) Design and develop a cam profile for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60° of cam rotation. The valve must remain in the fully open position for 20° of cam rotation. The valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is provided with a roller of radius 20 mm and its line of stroke passes through the axis of the cam. **(16)**

(OR)

- (b) The following data are for a disc cam mechanism with roller follower : Minimum radius of the cam = 35 mm, lift of the follower = 40 mm, Offset of the follower = 10 mm right, Roller diameter = 15 mm, Cam rotation angles are as mentioned below : During ascent = 120°, Dwell = 80°, During descent = 80°, Dwell = 80° Cam rotates in clockwise direction and the follower motion is simple harmonic during both ascent and descent. Develop the displacement diagram of the follower and indicate the relevant data. Design and draw the cam profile and indicate the relevant data. **(16)**
12. (a) (i) 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 **(8)**
- (ii) A pair 20° full depth involute spur gear having 30 and 50 teeth respectively module 4 mm arc in mesh, the smaller gear rotates at 1000 rpm. Determine (a) Sliding velocities at engagement and disengagement of a pair of teeth and (b) Contact ratio. **(8)**

(OR)

- (b) The arm of an epicyclic gear train rotates at 100 rpm in the anticlock wise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the centre of wheel A. Find the speed of wheel B. What will be the speed of B, if the wheel A instead of being fixed, makes 200 rpm **(16)**