

Reg. No. :

--	--	--	--	--	--	--	--	--	--

Question Paper Code: 44702

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

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)

- The lower pair is a
 - Open pair
 - Sliding pair
 - Closed pair
 - Point contact pair
- A simple mechanism has
 - 1 link
 - 2 link
 - 3 link
 - 4 link
- There are two points P and Q on a planar rigid body. The relative velocity between two points
 - Should always be along PQ
 - Can be oriented along any direction
 - Should always be perpendicular to PQ
 - Should be along QP when the body undergoes pure translation
- The number of instantaneous centres for a planar 4 bar mechanism is
 - 2
 - 4
 - 6
 - 8
- In a The size of a cam depends upon
 - base circle
 - pitch circle
 - prime circle
 - pitch curve

6. For a given lift of the follower of a cam follower mechanism, a smaller base circle is desired
- (a) because it will give a steeper cam and higher pressure angle
 - (b) because it will give a profile with lower pressure angle
 - (c) because it will avoid jumping
 - (d) None of these
7. For a speed ratio of 100, smallest gear box is obtained by using
- (a) a pair of spur gears
 - (b) a pair of helical and a pair of spur gear compounded
 - (c) a pair of bevel and a pair of spur gear compounded
 - (d) a pair of helical and a pair of worm gear compounded
8. 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
9. The angle of inclination of the plane, at which the body begins to move down the plane, is called
- (a) angle of friction
 - (b) angle of repose
 - (c) angle of projection
 - (d) none of these
10. Which of the following clutches is positive type
- (a) Cone
 - (b) Disc
 - (c) Jaw
 - (d) Centrifugal

PART - B (5 x 2 = 10 Marks)

11. Write down the Grashoff's law for four bar mechanism.
12. What is the expression for Corioli's component of acceleration?
13. List the terms used in cam.
14. Define pressure angle of a gear.
15. Write four applications of band brakes.

PART - C (5 x 16 = 80 Marks)

16. (a) Sketch and explain the inversions of double slider crank chain. (16)

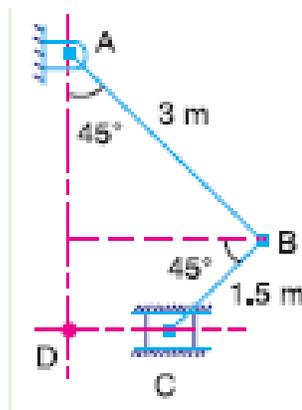
Or

(b) Explain the application of kutzbach Criterion to Plane Mechanisms. (16)

17. (a) 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)

Or

- (b) In the mechanism shown in Figure, the slider C is moving to the right with a velocity of 1 m/s and an acceleration of 2.5 m/s^2 . The dimensions of various links are $AB = 3 \text{ m}$ inclined at 45° with the vertical and $BC = 1.5 \text{ m}$ inclined at 45° with the horizontal. Determine: 1. The magnitude of vertical and horizontal component of the acceleration of the point B, and 2. the angular acceleration of the links AB and BC. (16)



18. (a) A cam is to give the following motion to a knife edged follower: (a) Outstroke during 60° of cam rotation (b) Dwell for the next 30° of cam rotation (c) Return stroke during next 60° of cam rotation and (d) Dwell for the remaining of cam rotation. The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft. (16)

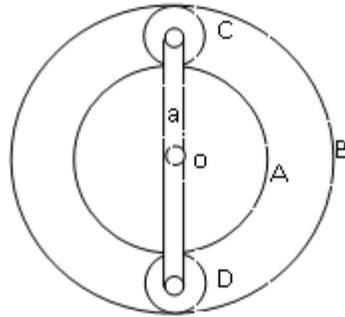
Or

- (b) 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)

19. (a) A pinion of 20 involute teeth and 125 mm pitch circle diameter drives a rack. The addendum of both pinion and rack is 6.25 mm. What is the least pressure angle which can be used to avoid interference? With this pressure angle, find the length of the arc of contact and the minimum number of teeth in contact at a time. (16)

Or

- (b) 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)



20. (a) A belt drive transmits 8 kW of power from a shaft rotating at 240 rpm to another shaft rotating at 160 rpm. The belt is 8 mm thick. The diameter of the smaller pulley is 600 mm and two shafts are 5 m apart. The coefficient of friction is 0.25. If the maximum stress in the belt is limited to 3 N/mm², find the width of the belt for (i) an open belt drive and (ii) a cross belt drive. (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)