Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 11404

B.E./ B.Tech. DEGREE EXAMINATION, APRIL/ MAY 2011

Third Semester

Mechanical Engineering

ME 2203 — KINEMATICS OF MACHINERY

(Regulation 2008)

(Common to PTME 2203 kinematics of machinery for B.E. (Part- Time)
Mechanical Engineering Third Semester — Regulation 2009)

Time : Three hours   Maximum : 100 marks

(A₁ Drawing sheet is to be supplied)

Answer ALL questions

PART A — (10 × 2 = 20 marks)

1. What is a kinematic Chain? Check whether the following Mechanisms form a kinematic chain (or) not.

   (a) Beam Engine

   (b) Slider- crank Mechanism.

2. Explain the following:

   (a) Kutzbach criterion

   (b) Grashoff's law.

3. Define Transmission angle of the four - bar Mechanism. What is the worst value of Transmission angle?

4. What is Coriolis component of acceleration?

5. Define Pressure angle of a cam mechanism and state the ideal value of the pressure angle.

6. State the advantages of a tangent Cam and sketch it.

7. What is epicyclic gear train? Give a practical example.

8. What is the use of Differential in an automobile?

9. What is the difference between sliding friction and rolling friction? Give example.

10. What are the advantages and disadvantages of V - Belt drive over flat belt drive?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain how the return stroke is made faster than the forward stroke in the crank and slotted lever quick return mechanism with neat sketches. (8)

    (ii) In a crank and slotted lever quick return motion mechanism, the distance between the fixed centers is 240 mm and the length of the crank is 120 mm. Find the inclination of the slotted bar with the vertical in the extreme position and the time ratio of cutting stroke to the return stroke. If the length of the slotted bar is 450 mm, find the length of the stroke passes through the extreme positions of the free end of the lever. (8

Or

    (b) What is Inversion of mechanism? With neat sketch and explain any two inversion of double slider crank chain mechanism. (16)

12. (a) The following data refer to the lengths of links of a six link mechanism in which the rotary motion of the input link 2 is transformed to the horizontal linear motion of the output slider 6.

    Fixed link 1, A_0B_0 = 60 mm, Input link 2 A_0A = 25 mm, Coupler link 3, AB = 85 mm, Follower link 4, BB_0 = 55 mm, Connecting rod 5, CD = 60 mm.

    The pin joint C is at the centre of link BB_0 The horizontal line of stroke of the slider passes through the fixed link pivots A_0 and B_0. $\lfloor B_0 A_0 A$ is 60°.

    In the position,

    (i) Sketch the mechanism and indicate the data.

    (ii) Draw the velocity diagram and determine the linear velocity of the slider, if the input link constant speed is 2 rad/ sec. clockwise.

    (iii) Draw the acceleration diagram and determine the linear acceleration of the slider, which is connected at one end of the connecting rod, CD.

Or

11404

(b) A mechanism of a crank and slotted lever quick return motion is shown in Figure 1. If the crank rotates counter clockwise at 120 r.p.m., Determine for the configuration shown, the velocity and acceleration of the ram D. Also determine the angular acceleration of the slotted lever. Crank. AB = 150mm; Slotted arm, OC = 700mm and link
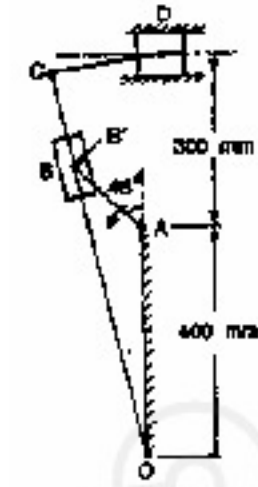CD = 200mm.

Figure 1.

13. (a) A cam with 30 mm as minimum diameter is rotating clock wise at a uniform speed of 1200 r.p.m and has to give the following motion to a roller follower 10mm in diameter :

(i) Follower to complete outward stroke of 25 mm during 120° of cam rotation with equal uniform acceleration and retardation.

(ii) Follower to dwell for 60° of cam rotation.

(iii) Follower to return to its initial position during 90° of cam rotation with equal uniform acceleration and retardation.

(iv) Follower to dwell for the remaining 90° of cam rotation.

Draw the cam profile if the axis of the roller follower passes through the axis of the cam.

Find the maximum velocity and accumulation of the follower during return stroke.

Or

(b) In a symmetrical tangent cam operating a roller follower, the least radius of the cam 30 mm and the roller radius is 15 mm. the angular of assent is 75° and the total lift is 20mm. the speed of the cam is 600 rpm. Calculate

(i) The principal dimensions of the cam.

3   11404

(ii) The acceleration of the follower at the beginning of lift, where straight flank merges into the circular nose and at the apex of the nose.

14. (a) A pair 20° full depth involute gears having 30 and 50 teeth respectively of module 4 mm are in mesh, the smaller gear rotates at 1000 r.p.m . Determine: (i) sliding velocities at engagement and at disengagement of a pair of teeth and (ii) contact ratio.

Or

(b) Two planet gears B and C having 30 teeth each are attached to the arm
E as shown in Figure 2 and gear A is having 40 teeth instead of 50, then find the number of revolutions made by the arm when:

(i) Gear a makes one revolution clockwise and D makes half a revolution anticlockwise.

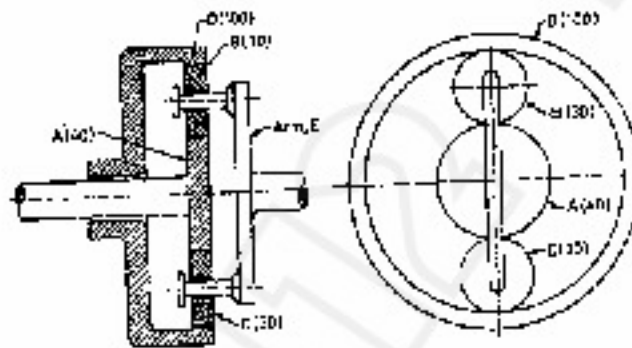(ii) Gear A makes one revolution clockwise and D is stationary.

Figure 2.

15. (a) (i) An effort of 1200 N is required to just move a certain body up an inclined plane of angle 12° with force acting parallel to the plane. If the angle of inclination is increased to 15°, then the effort required is 1400 N. Find the co efficient of friction and the weight of the   body.

(8)

(ii) The efficiency of a screw jack is 55%, when a load of 1500 N is lifted by an effort applied at the end of a handle of length 0.5 m. Determine the effort applied if the pitch of the screw thread is 10 mm. (8)

Or

(b) (i) Prove or disprove the following statement: "A V-belt drive with same co-efficient of friction and angle of warp as a belt drive will transmit less power than flat —belt drive". (6)

(ii) Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 2.1 m apart and are connected by a crossed belt. The larger pulley rotates at 225 rpm. The maximum permissible tension in the belt is 1 KN and the co-

4

11404

efficient of friction between the belt and the pulley is 0.25. Find the length of the belt required and the power that can be transmitted. (10)

—————————