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Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2007

ME 04 504—MECHANICS OF MACHINERY

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

1. (a) Define transmission angle of a four-bar mechanism. What are the worst values of transmission angle ?

   (b) Sketch and explain the inversions of a four bar chain mechanism.

   (c) Explain pressure angle and under cutting in a Cam.

   (d) Why a Roller follower is preferred to that of Knife—Edged follower ?

   (e) What is meant by epicyclic gear train ? Give a practical example.

   (f) Derive the condition for constant velocity ratio of toothed wheels.

   (g) Describe the classifications for synthesis problem.

   (h) Explain overlay method with one example.

(8 × 5 = 40 marks)

2. (a) A mechanism, as shown in figure 1 has the following dimensions: OA = 200 mm, AB = 1.5 m, BC = 600 mm CD = 500 mm and BE = 400 mm. Locate all the instantaneous centres. If the crank OA rotates uniformly at 120 r.p.m. clockwise, find :

   (i) The velocity of B, C, D.

   (ii) The angular velocity of the links AB, BC and CD.

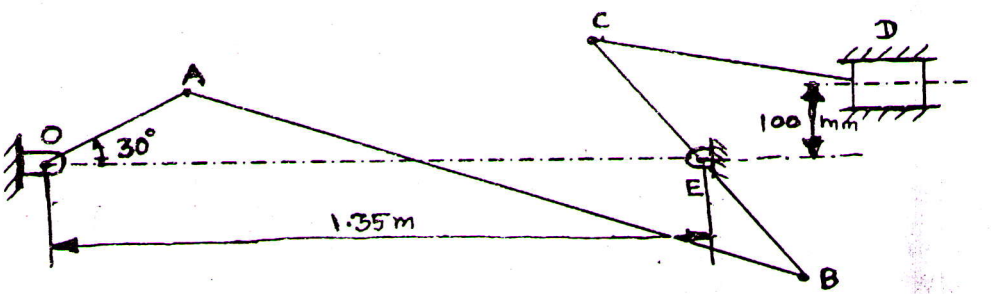

Figure. 1

Or

(b) In a four-bar mechanism PQRS, the link PS is fixed. The length of the links are PQ = 25 mm, OR = 85 mm, RS = 50 mm and PS = 80 mm. The crank PQ rotates at 1o rad/s clockwise. Sketch the mechanism and draw the velocity and acceleration diagram when the link PQ makes 60° with link PS. Find the angular velocity and angular acceleration of links OR and RS.

Turn over

3. (a) A Cam, with a minimum radius of 25 mm, rotating clockwise at a SHM is to be designed to give a roller follower, and the follower motion is described below :

(i) Follower to move outward through 45 mm during 80° of cam rotation.

(ii) Follower to dwell for next 45°.

(iii) Follower to return to its original position during next 120°.

(iv) Follower to dwell for the rest of the cam rotation.

The diameter of the roller is 20 mm and the diameter of the cam shaft is 30 mm. Draw the profile of the cam when the line of stroke of the valve road passes through the axis of the cam shaft.

Or

(b) A cam has straight working faces which are tangent to a base circle of diameter 90 mm. the follower is a roller of diameter 30 mm and the centre of roller moves along a straight line passing through the centre line of the came shaft. The angle between the tangent faces of cam is 90 and the face are joined by a nose circle of 10 mm radius. The speed of rotation of the cam is 200 r.p.m. Find the acceleration of the roller centre1. When during the life, the roller is just about to leave the straight flank ; and 2. When the roller is at the outer end of its lift.

4. (a) In an Epicyclic gear of the 'sun and planet' type shown in figure 2 the pitch circle diameter of the internally toothes ring is to be 224 mm and the module 4 mm. When the ring D is stationery, the spider A, which carries three planet wheels C of equal size, is to make one revolution in the same senses the sunwheel B for every five recvolutions of the driving spindle carrying the sunwheel B. Determine the suitable numbers of teeth for all the wheels.

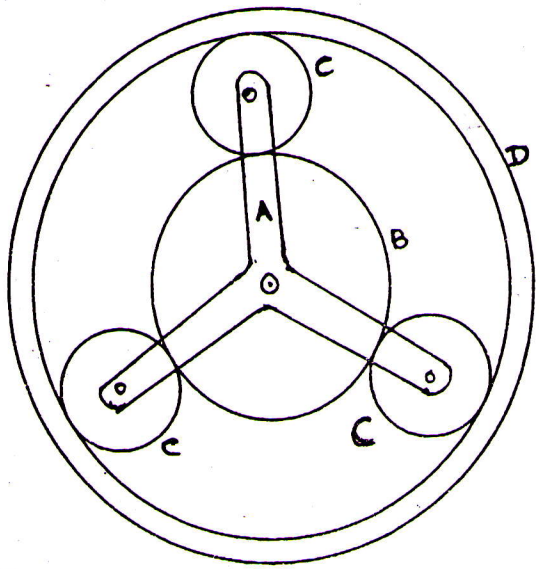

Figure. 2

Or

(b) Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 6 mm and the pitch line speed is 1.2 m/s, assumed addendum as standard and equal to one module find :

(i) The angle turned through by pinion when one pair of teeth is in mesh.

(ii) The maximum velocity of sliding.

5. (a) Describe the method of designing a four bar mechanism as a function generation.

Or

(b) Explain how to find the length of the links in four bar Mechanism using Freudenstein's Method.

(4 × 15 = 60 marks)