D 27114 **(Pages 3)** **Name**.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2006

ME 04 504—MECHANICS OF MACHINERY

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

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

   (i) Beam Engine ; (ii) Slider crank Mechanism

   (b) Explain Grubler's criterion for determining degree of freedom for mechanisms.

   (c) Draw a neat sketch of a cam and follower and define the various terms used in cam profile.

   (d) Explain the term 'Interference in cam.

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

   (f) Distinguish between Epicyclic gear train and Reverted gear train with neat sketch

   (g) Describe the classifications for synthesis problem.

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

2. (a) In Fig. 1 the angular velocity of the crank OA is 700 rpm. Determine the linear velocity of the slider D and the angular velocity of the link BD, when the crank is inclined at an angle of 75° to the vertical. The dimensions of various links are: OA = 28 mm; AB = 44 mm; BC = 49 mm; and BD = 46 mm. The centre distance between the centres of rotation O and C is 65 mm. The path of travel of the slider is 11 mm below the fixed point C. the slider moves along a horizontal path and OC is vertical.

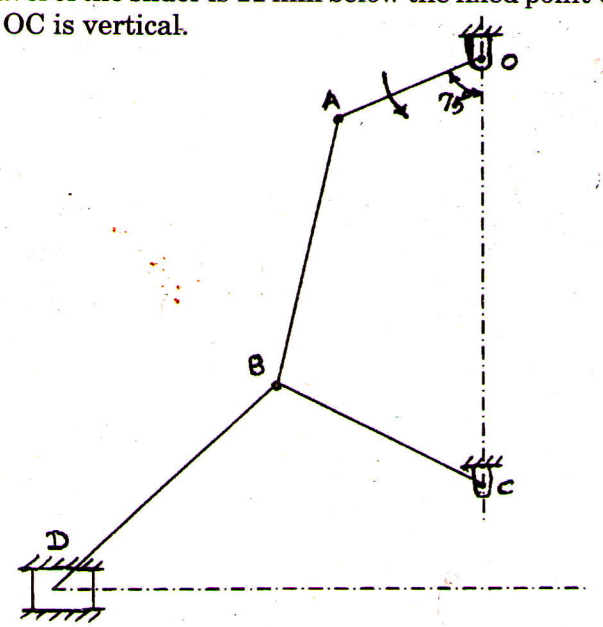

Fig. 1.

Or

(b) Determine the greatest permissible angle between the axes of the two shafts which are connected by a Hooke's joint if the maximum variation in the speed of the driven shaft is ± 5%. of the mean speed. The driving shaft is rotating at a uniform speed of 700 r.p.m. Also find the maximum and the minimum speeds of the driven shaft.

3. (a) Draw the profile of the cam when the roller follower moves with SHM during outstroke and return stroke, as given below:

(i) Outstroke with maximum displacement of 40 mm during 180° of cam rotation.

(ii) Return stroke for the next 150° of cam rotation.

(iii) Dwell for the remaining 30° of cam rotation.

The minimum radius of the cam is 15 mm and the roller diameter of the follower is 10 mm. The axis of the roller is offset by 10mm towards right from the axis of cam.

Or

(b) In a symmetrical tangent cam operating a roller follower, the least radius of the cam is 30mm and roller radius is 17.5 mm. The angle of ascent is 75° and the total lift is 17.5 mm. The speed of the cam shaft is 500 r.p.m. Calculate : (i) the principal dimensions of the cam ; (ii) the accelerations of the follower at the beginning of the lift, where straight flank merges into the circular nose and at the apex of the circular nose. Assume that there is no dwell between ascent and descent.

4. (a) An Epicyclic train as shown in Fig. 2 is composed of a fixed annular wheel A having 150 teeth. Meshing with A is a wheel B which drives wheel D through an idle wheel C, D being concentric with A. Wheels B and C are carried on an arm which revolves clockwise at 100 r.p.m. about the axis of A or D. If the wheels B and D are having 25 teeth and 40 teeth respectively, find the number of teeth of C and the speed and sense of rotation of C.

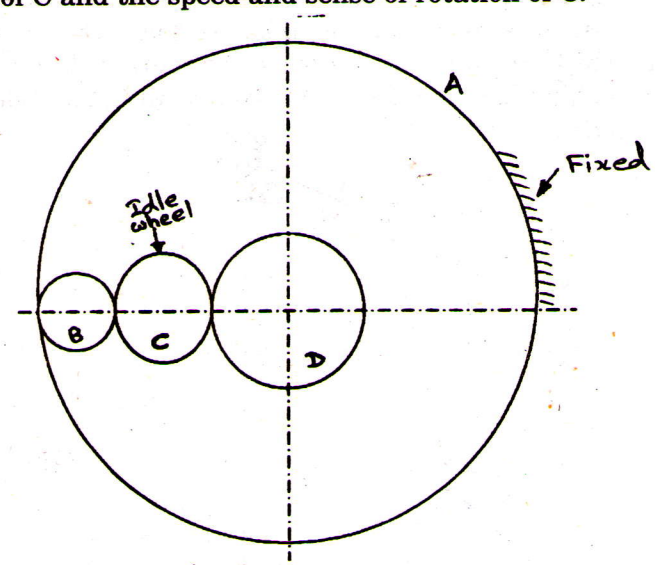

Fig.2.

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 6mm and the pitch line speed is 1.2m/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) Explain how to find the length of the links in four bar Mechanism using Freudenstein's Method.

Or

(b) Synthesize a four bar mechanism to guide a rod AB through three consecutive positions A_1B_1, A_2B_2, and A_3B_3 as shown in Fig 3.

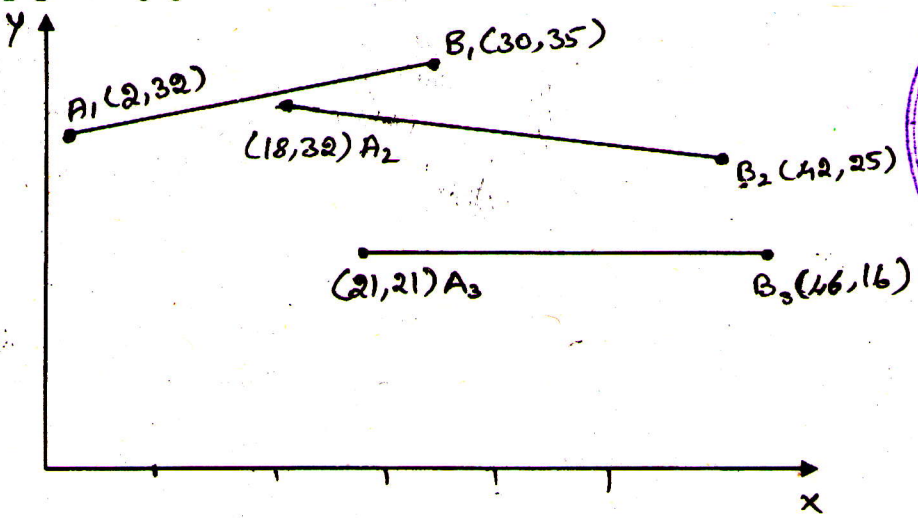

Fig. 3.