Code No: NR220304 **NR**

II B.Tech II Semester Supplementary Examinations, Nov/Dec 2005
KINEMATICS OF MACHINERY
MECHANICS OF MACHINERY
(Common to Mechanical Engineering, Mechatronics, Production Engineering and Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find out the degrees of freedom of the gear system shown in the following Figure 1.
   (b) The distancce between two parallel shafts is 15 mm and they are connected by an Oldham's coupling. The driving shaft revolves at 150 r.p.m.What will be the maximum speed of sliding of the tongue of the intermediate piece along its groove?
   (c) What are resistant bodies? Is it necessary that the resistant bodies be rigid? Give reasons for your answer.

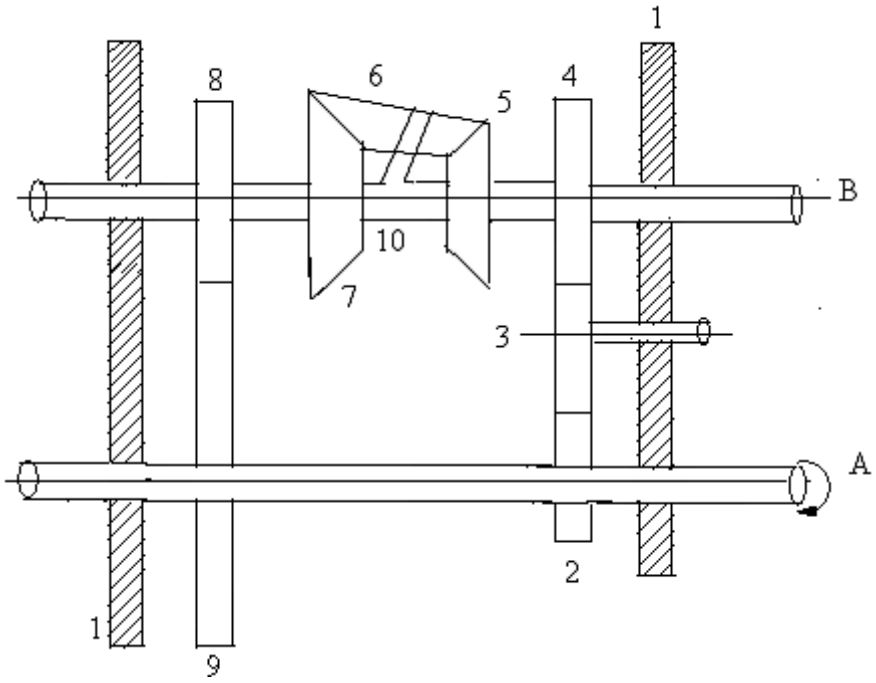

Figure 1:

[4+8+4]

2. (a) What are straight line motion mechanisms? Name the different types of mechanisms used for straight line motion.
   (b) Sketch the Peaucellier straight line motion and prove that the tracing point 'P' describes a straight line path. [4+12]

3. For the configuration of the mechanism shown in Figure 2, Determine the velocity and acceleration of P and the angular velocity and angular acceleration of BP when OA is rotating at 180rpm with an angular acceleration of 50radian/sec^2. P is constrained to move in horizontal direction.

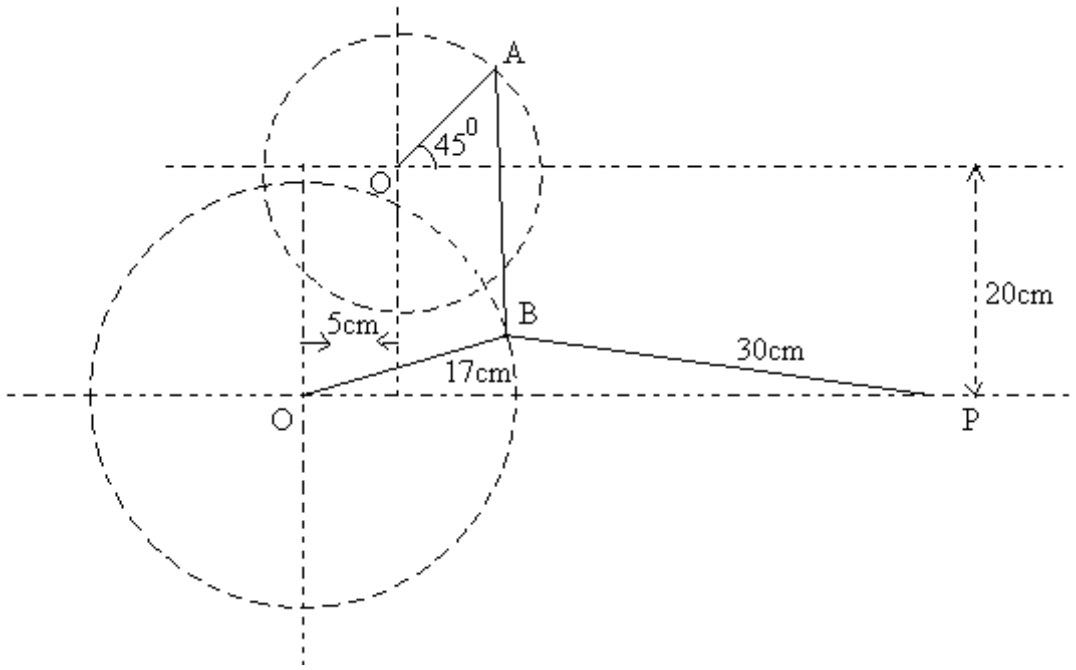

Figure 2:

[16]

4. (a) State and prove Kennedy's theorm of instantaneous centers.
   (b) In a four bar chain ABCD, A and D are fixed centers 12.5 cm apart. The driving crank AB = 6.25 cm, at certain instant makes an angle of 60^0 with AD. The driven crank CD and the coupler BC are 7.5 cm each. Determine the following when the driving crank makes 10 r.p.m in clockwise direction:
      i. The angular velocities of the links CD and CB
      ii. of the angular acceleration of the link CD by instantaneous centre method.

   [8+8]

5. Two shafts are to be connected by a Hooki's joint. The driving shaft rotates at a uniform speed of 500 rpm and the speed of the driven shaft must lie between 475 and 525 rpm. Determine the maximum permissible angle between the shafts. [16]

6. (a) Explain the procedure for drawing the displacement, velocity and acceleration diagrams for a radial cam with uniform acceleration and retardation of the follower.
   (b) Give the expressions for maximum velocity and acceleration of the follower during ascent and descent with respect to the above motion. [8+8]

7. Two gears in mesh have a module of 8 mm and pressure angle of 20^0. The larger gear has 57 teeth while pinion has 23 teeth. If the addenda on pinion and gear wheel are equal to one module. Determine

   (a) the number of pairs of teeth in contact.

   (b) The angles of action of the pinion and the gear wheel

   (c) the ratio of the sliding velocity to the rolling velocity at the beginning of engagement, at the pitch point and at the end of engagement. [16]

8. An epicyclic train is shown in Figure 3 13 Internal gear A is keyed to the driving shaft and has
   30 teeth. Compound wheel C and D of 20 and 22 teeth respectively are free to rotate on the pin fixed to the arm P which is rigidly connected to the driven shaft. Internal gear B which has 32 teeth is fixed. If the driving shaft runs at 60 r.p.m. clockwise, determine the speed of the driven shaft. What is the direction of rotation of driven shaft with reference to driving shaft?

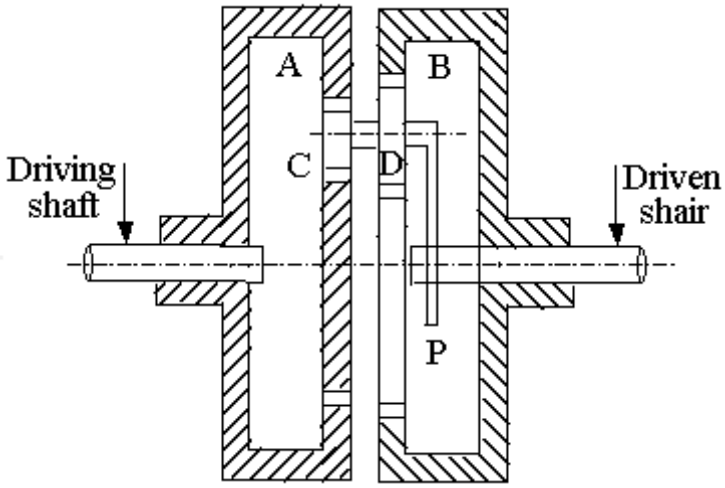

Figure 3:

[16]

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