Code No: RR-222105/
NR-220304

Set No: 1

II-B.Tech II-Semester Regular Examinations April/May, 2004

KINEMATICS OF MACHINERY
(RR-Aeronautical Engineering)
(NR- Common to Mechanical Engineering, Production Engineering, Mechatronics)

MECHANICS OF MACHINERY
(NR-Aeronautical Engineering)

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

Answer any FIVE questions
All questions carry equal marks

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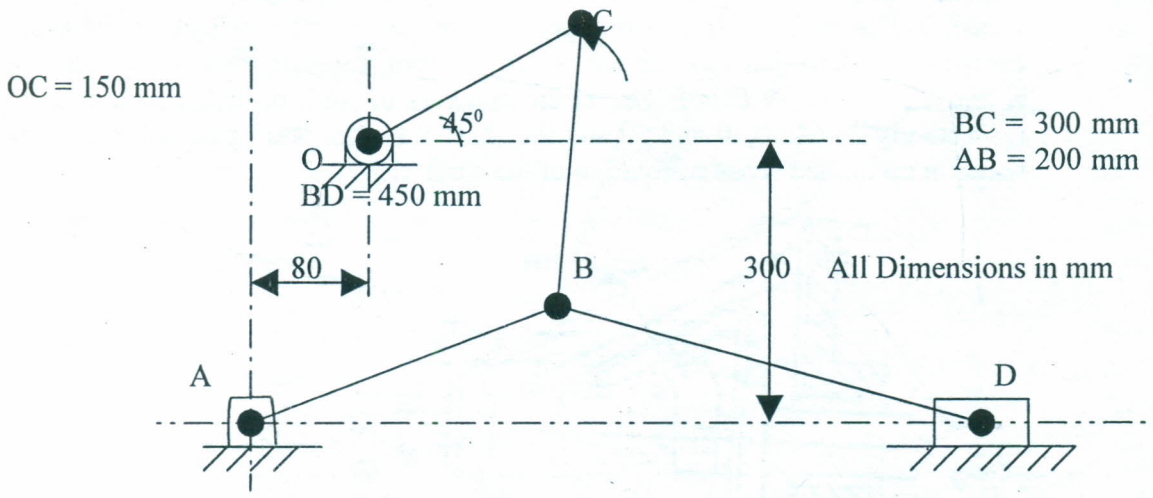
1. a) Define motion and state its types. Distinguish between completely constrained, partially constrained and incompletely constrained motions. Where do you find their applications?
   b) What is meant by degrees of freedom of a mechanism?

2. Explain how the velocity and acceleration in the following mechanisms are calculated by relative velocity method:
   (a) Four bar chain (b) Single slider crank chain

3. In a mechanism shown in Figure, D is constrained, to move on a horizontal path. Find, for the given configuration the velocity and acceleration of D and the angular velocity and angular acceleration of BD when OC is rotating in a counter clockwise direction at a speed of 210 r.p.m.



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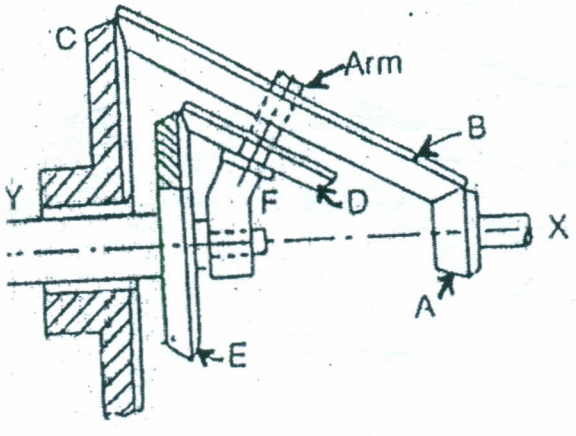
4. a) Define the term instantaneous centre of rotation.
   b) Sketch a quick return motion of the crank and slotted lever type and explain the procedure of drawing the velocity and acceleration diagram, fro any given configuration of the mechanism.

5. a) Explain why two Hooke's Joints are used to transmit motion from the engine to the differential of an automobile.
   b) A double universal joint is used to connect two shafts in the same plane. The intermediate shaft is inclined at an angle of 20 to the driving shaft as well as the driven shaft. Find the maximum and minimum speed of the intermediate shaft and the driven shaft if the driving shaft has a constant speed of 500 R.P.M.

6. From the following data, draw the profile of a cam in which the follower moves with *simple harmonic motion during ascent while it moves with uniform velocity motion* during descent: Least radius of cam = 50mm; Angle of ascent = 48 ; Angle of dwell between ascent and descent = 42 ; Angle of descent = 60 ; Lift of follower = 40mm; Diameter of roller = 30mm; Distance between the line of action of follower and the axis of cam = 20mm. If the cam rotates at 360 r.p.m. anticlockwise, find the maximum velocity and acceleration of the follower during descent.

7. a) Prove that the change in centre distance within limits between involute gears does not change the angular velocity ratio but alters the pressure angle
   b) Find the length of arc of contact, contact ratio and maximum velocity of sliding between two mating gears if the number of teeth on pinion and gear are 24 and 33. Take module pitch is 4.25 mm; pressure is 20^0 and addendum of one module. The pinion rotates at 150 rpm.

8. A shaft Y is driven by a co-axial shaft X by means of an epicyclic gear train, as shown in Figure. The wheel A is keyed to X and E to Y. The wheels B and D are compound and carried on an arm F which can turn freely on the common axes of X and Y. The wheel C is fixed. If the numbers of teeth on A,B,C,D and E are respectively 20,64,80,30 and 50 and the shaft X makes 600 r.p.m. determine the speed in r.p.m. and sense of rotation of the shaft Y.



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