

COLLEGE OF ENGINEERING PUNE- 05

End Semester Examination (ESE)

(ME-209) Theory of Machines

2011-12

Class: S. Y. Production

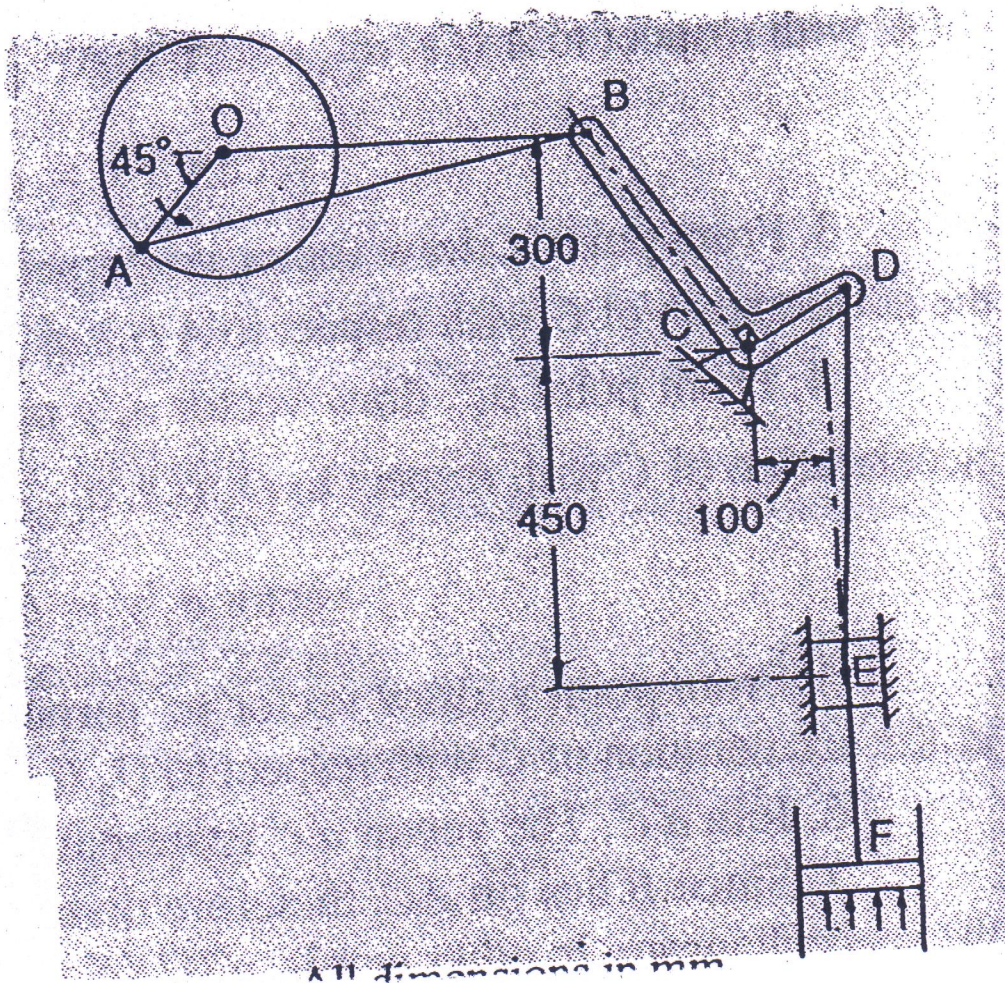
Maximum Marks: 50

Time: Three Hours

- N.B:- (i) Solve any one question from Q: 1) or Q:2)
 (ii) Figures to the right indicate full marks.
 (ii) Use of Non Programmable calculator is allowed.
 (iii) Assume suitable data, if necessary.

- Q: 1] A pump is driven from an engine crank-shaft by the mechanism as shown in **figure no.1**. The pump piston shown at F is 250 mm in diameter and the crank speed is 100 rpm. The dimensions of various links are, OA= 150 mm; AB= 600 mm; BC= 350 mm; CD= 150 mm and DE= 500 mm. Determine for the position shown, by relative velocity and acceleration method:
- 1) Velocity of cross- head E
 - 2) The torque required at the crankshaft to overcome a pressure of 0.35 N/mm^2
 - 3) The acceleration of the cross head E

[10]



OR

- Q: 2] In the mechanism shown in figure no.2, O and Q are fixed centers. $OC=125$ mm, $CP=500$ mm, $AQ=250$ mm & $AP=125$ mm. If crank OC rotates at a uniform speed of 120 rpm in clockwise direction, find angular velocity of link CP, PA and AQ and linear velocity of slider P by using theorem of three centers in line and locate maximum possible ICR'S.

[10]

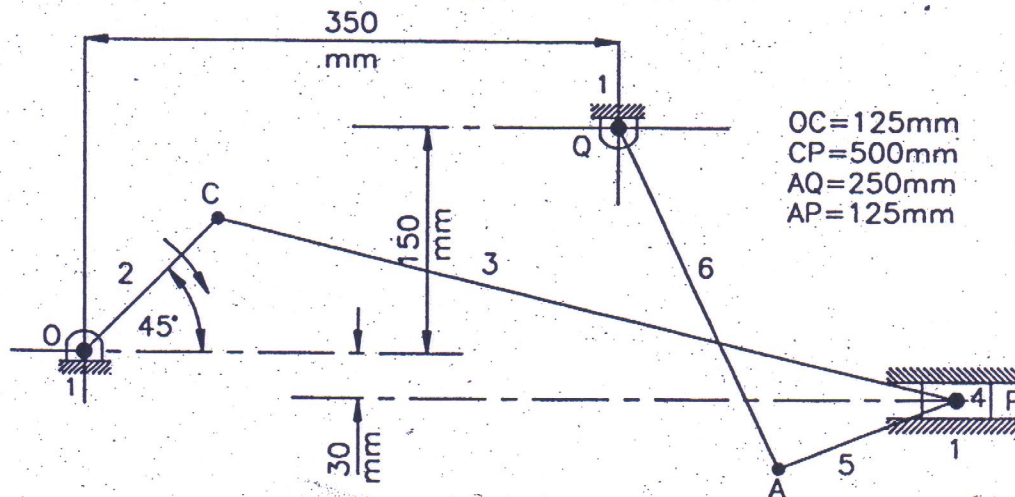


Figure NO:-2

- Q: 3] The connecting rod of an horizontal engine, 260 mm long between the centers, has mass of 125 kg and its centre of gravity is 80 mm from the big end centre. The stroke length of engine is 120 mm. The rod makes 21 complete oscillations in 20 seconds when suspended as a pendulum from gudgeon pin axis. When the crank is 40° from I.D.C and is rotating at 1500 rpm clockwise, determine by **analytical or graphical method**;

- 1) The radius of gyration of rod
- 2) The inertia torque exerted on crankshaft

[15]

- Q: 4] A whitworth bolt with an angle of V-threads as 55° has a pitch of 6 mm and a mean diameter of 32 mm. The mean radius of the bearing surface where the nut is tightened is 20 mm. Determine the force required at the end of a 400 mm long spanner when the load on the bolt is 8 KN. The coefficient of friction for the nut and bolt is 0.1 and for the nut and the bearing surface is 0.15.

[5]

Q: 5] A leather belt is required to transmit 7.5 kW from a pulley 1.2 m in diameter running at 250 rpm. The angle embraced is 165 degrees and the coefficient of friction between the belt and pulley is 0.3. If the safe working stress for the belt is 1.5 Mpa, density of leather is 1000 kg/m^3 and thickness of belt is 10 mm, determine the width of belt taking centrifugal tension into account.

[5]

Q: 6] Attempt any three of the following

[15]

- 1) Explain Loop-Closure equation and its significance in kinematics, with suitable examples.
 - 2) Define efficiency of Screw jack and derive the expression of Maximum efficiency of Screw jack
 - 3) Explain the procedure to select Flat Belt from Manufacturer's Catalogue.
 - 4) Explain Hart's Straight line motion Mechanism with neat sketch.
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