

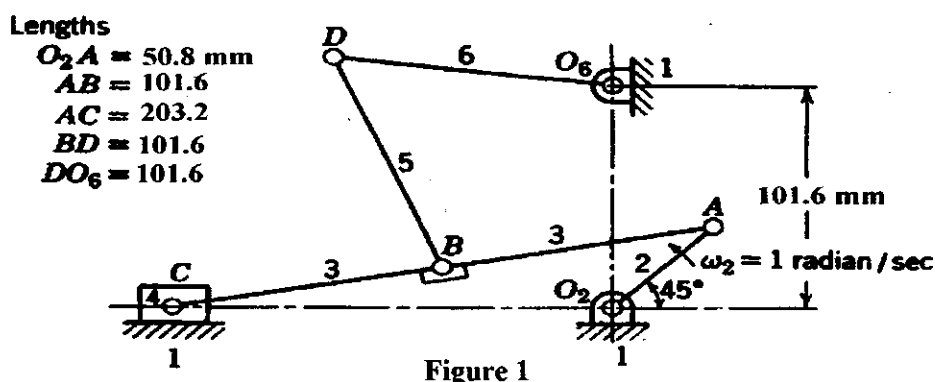
University of Technology-Electromechanical Engineering Dept.
Final Exam 2013-2014

Class: 3th Systems
Subject: Theory of machine
Examiner: Dr. Ali Kamil



Time: 3 hours
Date:
Note: solve five questions
only including first question

- Q1) (a) Construct the velocity diagram for the mechanism of Figure 1 and determine the velocity of point D.
(b) Construct the acceleration diagram using a unit value of the angular velocity of the driving link ($\alpha_2 = 0$). Calculate the acceleration of point D.



(12 degree)

- Q2) When in mesh, two gear wheels with 95 and 20 teeth of involute form rotate in opposite directions and operate with a pressure angle of 20° , a module of 4 mm and a contact ratio of 1.5. The arc of recess is 1.2 times the arc of approach. The smaller wheel runs at 2000 rev/min and transmits 4 kW to the larger wheel. Determine: (a) the addenda of the two wheels, (b) the greatest speed of sliding between mating teeth.

(12 degree)

- Q3) In the epicyclic shown in Figure 2, the gear B has 120 teeth externally and 100 internally. The driver A has 20 teeth and the arm E is connected to the driven shaft. Gear D has 60 teeth. If gear A revolves at + 100 r/min and D revolves at + 27 r/min, find the speed of the arm E.

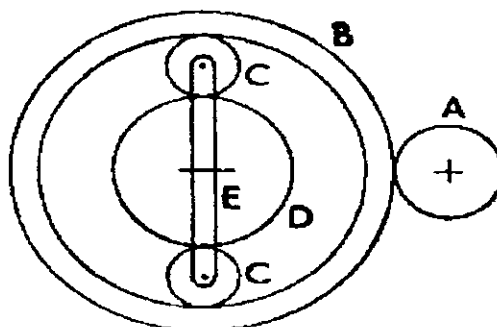


Figure 2

(12 degree)

Q4) A leather belt is required to transmit 7.5 kW from a pulley 1.2 m in diameter, running at 250 r.p.m. The angle embraced is 165° and the coefficient of friction between the belt and the pulley is 0.3. If the safe working stress for the leather belt is 1.5 Mpa, density of leather 1 Mg/m^3 and the thickness of belt 10 mm, determine the width of the belt taking centrifugal tension into account.

(12 degree)

Q5) A machine shaft running at a mean speed of 200 rpm requires a torque which varies uniformly from 1200 Nm to 3600 Nm during the first half revolution, remains constant for the next one revolution, decreases uniformly to 1200 Nm during the next one revolution and then remains constant for the next two revolutions, thus completing a cycle of operations. It is driven by a constant speed motor and a flywheel of radius of gyration 0.6 m is fitted to the shaft. If the fluctuation of speed is $\pm 2\%$ of mean speed, find

1. The power of the motor, and
2. The mass of the flywheel required.

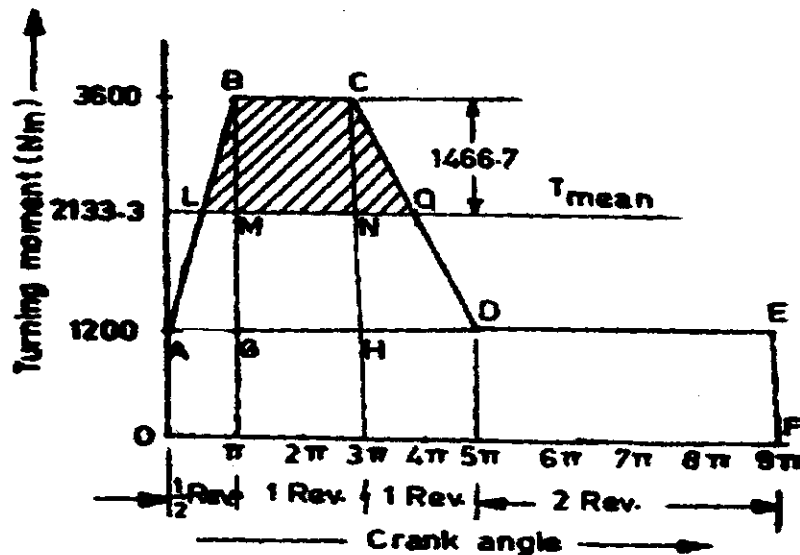


Figure 3

(12 degree)

Q6) A friction clutch is required to transmit 34.5 kW at 2000 rev/min. it is to be of single-plate disc type with both sides of the plate effective, the pressure being applied axially by means of springs and limited to 70 kN/m^2 . If the outer diameter of the plate is to be 300 mm. find the required inner diameter of the clutch ring and the total force exerted by the springs. Assume the wear to be uniform. $\mu = 0.3$

(12 degree)

[Signature]

With my best wishes