

Theory of Machines
(ME-203, Dec. 2006)

Time: 3 Hrs

Max Marks: 60

Note: Section A is compulsory. Attempt any four questions from Section B and any two questions from Section C.

Section-A

1. (a) What is a machine? Giving example, differentiate between a machine and a structure.
(b) "Slider crank Mechanism is only a special case of a four bar mechanism". Justify the statement.
(c) Explain why two Hooke's joints are used to transmit motion from the engine to the differential of an automobile.
(d) What is centrifugal tension in a belt? How does it affect the power transmitted?
(e) What is initial tension in a belt?
(f) Why roller follower is preferred to that of a knife edge follower?
(g) Which of the two assumptions-uniform intensity of pressure or uniform rate of wear would you make use of in designing friction clutch and why?
(h) What is static and dynamic balancing?
(i) What are the effects of friction and adding a central weight to the sleeve of a watt governor?
(j) Define (a) Stability (b) Isochronism

Section-B

2. Sketch and explain (a) elliptical trammel (b) Oldham's coupling
3. With a neat sketch derive the ratio of the shafts velocities for a universal joint.
4. Derive an expression for displacement, velocity and acceleration for a tangent cam operating on a radial-translating roller follower when the contact is on the straight flank.
5. A simple band brake is operated by a lever of length 500 mm. The brake drum has a diameter of 500 mm and the brake band embraces $\frac{5}{8}$ of the circumference. One end of the band is attached to the fulcrum of the lever while other end is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2k N and the coefficient of friction is 0.25, find the maximum braking torque on the drum.
6. Write a short notes on the following:
 - (a) Balancing of different masses revolving in the same plane.
 - (b) Balancing machines.

Section-C

7. In a four link Mechanism, the crank OA rotates at 36rad/s. The lengths of the links are: AB =200mm, BC=400mm, CD=450mm and AD=600mm. AD is the fixed link. At the instant when AB is at right angles to AD, determine the velocity of
 - (a) The mid point of link BC.
 - (b) A point on link CD, 100 mm from the pin connecting the links CD and AD.
8. (a) What are the merits and demerits of V-belt drive?
(b) What are different types of chains? Explain.
(c) Derive an expression for the length of an open belt drive.
9. In a spring loaded Hartnell type governor, the extreme radii of rotation of balls are 80mm and 120mm. The ball arm and the sleeve arm of the bell crank lever are equal in length. The mass of each ball is 2 kg. If the speeds at the two extreme positions are 400 and 420rpm, find the initial compression of the spring.