

M.E.S. COLLEGE OF ENGINEERING, PUNE – 411 001

Department of Mechanical Engineering

SE Mechanical (I & II) **Subject: Theory of Machine-I**

Defaulter Assignment Questions

Unit:I

1. Explain the term kinematic link. Give the classification of kinematic link.
2. What is a machine ? Giving example, differentiate between a machine and a structure.
3. Write notes on complete and incomplete constraints in lower and higher pairs, illustrating your answer with neat sketches.
4. Explain different kinds of kinematic pairs giving example for each one of them.
5. Explain the terms : 1. Lower pair, 2. Higher pair, 3. Kinematic chain, and 4. Inversion.
6. Explain Grubler's criterion for determining degree of freedom for mechanisms. Using Grubler's criterion for plane mechanism, prove that the minimum number of binary links in a constrained mechanism with simple hinges is four.
7. Sketch and explain the various inversions of a four bar chain.
8. Sketch slider crank chain and its various inversions, stating actual machines in which these are used in practice.
9. Sketch and explain any two inversions of a double slider crank chain.
10. What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism? Give examples.

Unit:II

- 1) State & Explain D'Alembert's Principle.
- 2) With the help of a neat schematic diagram, derive the frequency equation of a Trifilar suspension method.
- 3) Explain the concept of two mass dynamically equivalent system.
- 4) Explain the correction couple with neat sketch.

5) Explain the turning moment diagram for a four stroke internal combustion engine.

6) A connecting rod has a mass of 3kg. For 50 oscillations, it needs 40 seconds when suspended from small end and 35 seconds when suspended from big end. The distance between the point of suspension is 200mm. Find the moment of inertia of the connecting rod and position of its centre of gravity from the small end.

7) A connecting rod is suspended from a point 25mm above the small end centre and 650mm above its C.G. It takes 35 seconds for 20 oscillation. Find dynamically equivalent system of two masses when one mass is located at small end centre. Mass of the connecting rod is 40kg.

8) A rigid link, 500mm long, has mass 2kg and radius of gyration 200mm. Replace this link by dynamically equivalent system of two concentrated masses located at the ends of the link.

9) Following data relate to a horizontal reciprocating engine:

Mass of reciprocating parts = 120 kg

Crank length = 90 mm

Engine speed = 600 rpm

Mass of connecting rod = 90 kg

Length between centres = 450 mm

Distance of centre of mass from big end centre = 180 mm

Radius of gyration about an axis through centre of mass = 150 mm

Find the magnitude and direction of inertia torque on the crank shaft, when crank has turned through 30° from the I.D.C.