

**II B. Tech II Semester Supplementary Examinations,
Nov/Dec-2016 KINEMATICS OF MACHINERY (Com. to ME,
AME, MM)**

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**
- ~~~~~

PART -A

1. a) Explain the term kinematic link. Give the classification of kinematic link. (4M)
- b) Explain about Grasshopper mechanism (3M)
- c) Define rubbing velocity at a pin joint. What will be the rubbing velocity at pin joint when the two links move in the same and opposite directions ? (4M)
- d) Define the following terms as applied to cam with a neat sketch : (3M)
i) Pressure angle, and ii) Stroke of the follower.
- e) Write a short notes on classification of toothed wheels. (4M)
- f) What are the various types of the torques in an epicyclic gear train ? (4M)

PART -B

2. a) What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism? Give examples. (6M)
- b) Sketch and explain the various inversions of a four bar chain. (10M)
3. a) Explain why two Hooke's joints are used to transmit motion from the engine to the differential of an automobile. (8M)
- b) The angle between the axes of two shafts connected by Hooke's joint is 18° . (8M)
Determine the angle turned through by the driving shaft when the velocity ratio is maximum and unity
4. The crank and connecting rod of a theoretical steam engine are 0.5 m and 2 m long (16M) respectively. The crank makes 180 r.p.m. in the clockwise direction. When it has turned 45° from the inner dead centre position, determine :
i) velocity of piston , ii) angular velocity of connecting rod ,
iii) velocity of point E on the connecting rod 1.5 m from the gudgeon pin , iv) velocities of rubbing at the pins of the crank shaft, crank and crosshead when the diameters of their pins are 50 mm, 60 mm and 30 mm respectively ,v) position and linear velocity of any point G on the connecting rod which has the least velocity relative to crank shaft.



5. Derive the expressions for displacement, velocity and acceleration for a circular (16M)
arc cam operating a flat-faced follower
- when the contact is on the circular flank, and
 - when the contact is on circular nose
6. a) A pinion of 20 involute teeth and 125 mm pitch circle diameter drives a rack. The (8M)
addendum of both pinion and rack is 6.25 mm. What is the least pressure angle
which can be used to avoid interference? With this pressure angle, find the length
of the arc of contact and the minimum number of teeth in contact at a time.
- b) Write short notes on helical and bevel gears. (8M)
7. a) Obtain the velocity ratio of an epicyclic gear train by tabular method? (8M)
- b) A compound train consists of six gears. The number of teeth on the gears are as (8M)
follows :

Gear :	A	B	C	D	E	F
No. of teeth	60	40	50	25	30	24

The gears *B* and *C* are on one shaft while the gears *D* and *E* are on another shaft. The gear *A* drives gear *B*, gear *C* drives gear *D* and gear *E* drives gear *F*. If the gear *A* transmits 1.5 kW at 100 r.p.m. and the gear train has an efficiency of 80 per cent, find the torque on gear *F*.

