

II B.Tech II Semester Supplementary Examinations, April/May 2005
KINEMATICS OF MACHINERY
(Common to Mechanical Engineering, Mechatronics and Production Engineering)

Time: 3 hours**Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Sketch and explain any two inversions of a double slider crank chain.
(b) What are the different forms of quadric cycle chain?
2. Explain the following mechanisms:
 - (a) Grasshopper mechanism
 - (b) Tchebicheff's mechanism
 - (c) Robert's mechanism
3. The crank and connecting rod of a steam engine are 12 cm and 60 cm respectively. The centre of gravity of the connecting rod is 24 cm from the crank end. If the crank rotates at 300 r.p.m clockwise, determine, the following using Klein's construction.
 - (a) Velocity and acceleration of piston
 - (b) Angular velocity and angular acceleration of connecting rod.
 - (c) Velocity and acceleration of the centre of the gravity of the connecting rod and for the crank position at 300 from the inner dead center.
4. In a four bar chain ABCD, AD is the fixed link 12 cm long, crank AB is 3 cm long and rotates uniformly at 100 rpm clockwise while the link CD is 6 cm long and oscillates about D. Link BC is equal to length AD. Find the angular velocity of link DC when angle BAD is 60° .
5. Sketch the Davis gear and show that it satisfies the condition for correct steering. Also, explain, why Ackermann steering gear is preferred to Davis gear in actual practice.
6. (a) Explain the procedure for drawing the displacement, velocity and acceleration diagrams for a radial cam with simple harmonic motion of the follower.
(b) Give the expression for maximum velocity and acceleration of follower during ascent and descent with respect to the above motion.
7. (a) If the interference between two involute gears is to be avoided then prove that the maximum length of arc of contact will be equal to $(R + r) \tan \Phi$ where R and r = Pitch circle radius of wheel and pinion, Φ = Pressure angle.
(b) Two 20° involute spur gear having a velocity ratio of 2.5 meshes externally. Module is 4 mm and the addendum is equal to 1.23 module. Pinion rotates at 150 rpm. Find

- i. the minimum number of teeth on each wheel to avoid interference
 - ii. the number of pairs of teeth in contact.
8. An epicyclic gear consists of bevel wheels as shown in Fig 20. The driving pinion A has 20 teeth and meshes with the wheel B which has 25 teeth. The wheels B and C are fixed together and turn freely on the Shaft F. The shaft F can rotate freely about the main axis XX. The wheel C has 50 teeth and meshes with wheels D and E, each of which has 60 teeth. Find the speed and direction of E when A rotates at 200 r.p.m. if
- (a) D is fixed and
 - (b) D rotates at 100 r.p.m. in the same direction as A. In both the cases, find the ratio of the torques transmitted by the shafts of the wheels A and E, the friction being neglected.


