

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA VIZIANAGARAM
II B. Tech I Semester Supplementary Examinations, November – 2024
KINEMATICS OF MACHINERY
(Mechanical Engineering)

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

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

- 1 a) Explain any two inversions of a double slider crank chain mechanism with examples. [7]
b) Explain crank and slotted lever quick return motion mechanism to determine the ratio of time of cutting to time of return strokes. [7]
(OR)
- 2 a) What is Kutzbach's criterion for degrees of freedom of plane mechanism? [7]
b) Write the inversions of single slider crank chain and explain any two of them. [7]
- 3 a) Explain the peaucellier straight line motion mechanism with a neat sketch. [7]
b) What is Hooke's joint? Derive an expression for the ratio of angular velocities of the shafts of a Hooke's joint [7]
(OR)
- 4 a) Explain the working of Ackermann steering gear mechanism with a neat sketch. [7]
b) The two shafts of a Hooke's joint have their axes inclined at 20° . The shaft A revolves at a uniform speed of 1000 rpm. The shaft B carries a flywheel of mass 30 kg. If the radius of gyration of the flywheel is 100 mm, find the maximum torque in shaft B. [7]
- 5 a) Derive Kennedy theorem. [6]
b) OABC is a four bar chain with fixed link OC. The length of the links are OA= 40 mm, AB=150 mm, BC=80 mm and OC=150 mm. The crank OA rotates at 120 rpm clock wise. Find the angular velocity of the links AB and BC when angle COA= 60° by using I-Centre method [8]
(OR)
- 6 A slider crank mechanism of crank and connecting rod lengths are 300 mm and 950mm. The crank rotates at uniform speed of 250 rpm. When the crank is turned through an angle of 30° , from TDC. Determine [14]
i) the velocity and acceleration of slider and
ii) the angular velocity and angular acceleration of the connecting rod
- 7 Draw the profile of a cam operating a Knife-edged follower from the following data [14]
(a) Follower to move outward through 40 mm during 60° of a cam rotation;
(b) Follower to dwell for the next 45°
(c) Follower to return its original position during next 90°
(d) Follower to dwell for the rest of cam rotation.

The displacement of the follower is to take place with SHM during outward stroke and uniform acceleration and retardation during return stroke. The least radius of the cam is 50 mm. If the cam rotates at 300 rpm. Determine the maximum velocity of the follower during the outward stroke and return stroke.

(OR)

- 8 a) Deduce expressions for the length of belt in an open-belt drive. [5]
b) An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3 m apart and transmits 4 kW from the smaller pulley that rotates at 300 rpm. Coefficient of friction between the belt and the pulley is 0.3 and the safe working tension is 10 N per mm width. Determine (i) minimum width of belt, (ii) initial tension and (iii) length of the belt required. [9]

- 9 a) What is meant by interference in involute gears? [5]
b) Two equal involute gear wheels of 20° pressure angle have 20 teeth each. Calculate length of arc of contact if the addendum was standard and equal to one module. Pitch of teeth is 6mm of diameter per tooth. What should be the addendum, if the arc of contact is to be maximum possible? What is then the length of arc of contact? The angle turned through by the pinion while any one pair of teeth is in contact. [9]

(OR)

- 10 An internal wheel B with 80 teeth is keyed to a shaft F. A fixed internal wheel C with 80 teeth is concentric with B. A compound wheel D-E gears with the two internal wheels. D has 28 teeth and gears with C while E gears with B. The compound wheels revolve freely on a pin which projects from a disc keyed to a shaft A coaxial with F. If the wheels have the same pitch and the shaft makes 800 rpm, what is the speed of shaft F? Sketch the arrangement also. [14]
