

GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Semester-IV- Examination June- 2011****Subject code: 141902****Subject Name: Kinematics of Machines****Date: 10/06/2011****Time : 10:30 am to 1:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Evaluate – “The common normal at the point of contact between a pair of teeth must always pass through the pitch point” **07**
- (b) Explain (1) Peaucellier mechanism and (2) Roberts mechanism with neat sketch **07**

- Q.2** (a) Sketch and explain any two inversions of a double slider crank chain **07**
- (b) A crank and rocker mechanism ABCD has the following dimensions. **07**
 $AB = 0.75\text{m}$, $BC = 1.25\text{m}$, $CD = 1\text{m}$, $AD = 1.5\text{m}$. E is the midpoint of the coupler link BC. AD is the fixed link. Crank AB has an angular velocity of 20 rad/sec counter clockwise and a deceleration of 280 rad/sec^2 at the instant angle $DAB = 60^\circ$. Find: (1) Instantaneous linear velocity and acceleration of midpoint E of link BC, (2) Instantaneous angular velocity and acceleration of link CD

OR

- (b) Derive the equation of displacement, velocity and acceleration of slider in a slider crank mechanism by analytical method **07**
- Q.3** (a) An open belt drive is used to transmit 2.5 KW power. The belt is running at 2.5m/sec velocity over the pulleys. The angle of contact being 165° and co-efficient of friction being 0.3 what will be the effect on power transmission if the initial tension in belt is increased by 8% **07**
- (b) Explain compound belt and fast & loose pulley belt drive with neat sketch **07**

OR

- Q.3** (a) (1) Compare chain drive with rope drive **03**
- (2) Define: Kinematic pair, Give classification according to type of relative motion between the elements with sketch **04**
- (b) For an open belt drive prove that $T_1 / T_2 = e^{\mu \theta}$ with usual notations **07**
- Q.4** (a) Define: (1) Contact Ratio (2) Module (3) Circular pitch (4) Addendum **04**
- (b) What do you mean by interference in gear? **03**

- (c) Two mating involute spur gear of 20° pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 rpm . Module pitch of the teeth is 12 mm . Find: (1) The addendum for pinion (2) The addendum for gear wheel & (3) The length of the arc of contact. Assume pinion to be the driver **07**

OR

- Q.4** (a) Enlist different types of gear train. Explain compound gear train with neat sketch. Also derive the equation of the velocity ratio for compound gear train **07**

- (b) An epicyclic gear train as shown in fig – 1 has a sun wheel S of 30 teeth and two planet wheels P of 50 teeth. The planet wheel mesh with the internal teeth of a fixed annular A. The driving shaft carrying the sun wheel transmits 4 KW at 300 rpm. The driven shaft is connected to an arm which carries the planet wheel. Determine the speed of the driven shaft 07
- Q.5** (a) The mean diameter of screw jack having pitch of 10mm is 50mm. The load of 20 KN is lifted through a distance of 170mm. Find the work done in lifting the load and efficiency of the screw jack when (1) The load rotates with the screw (2) The load rest on the loose head which does not rotate with the screw. The external and internal diameters of the bearing surface of the loose head are 60mm and 10mm respectively. The co-efficient of friction of the screw as well as the bearing surface may be taken as 0.08 07
- (b) Derive the equation of effort required to move the body up the plane considering friction 04
- (c) Differentiate between overhauling and self locking of screw 03
- OR**
- Q.5** (a) Construct cam profile for a knife edge follower. Minimum radius of cam = 30mm, Stroke of follower = 24mm, Angle of rise = 90° , Dwell after rise = 60° , Angle of return = 120° , Dwell after return for rest of the period. Follower to move outwards with uniform velocity and return back with simple harmonic motion. The follower is offset to right by 15mm. The cam is to rotate in anticlockwise direction 07
- (b) Classify followers and explain with neat sketch 07

