

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-IV Remedial Examination Nov/ Dec. 2010****Subject code: 141902****Subject : KINEMATICS OF MACHINES****Date: 06 / 12 /2010****Time: 03.00 pm – 05.30 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) What is meant by inversions of mechanism? Sketch double slider crank chain and draw its inversion. **07**
- (b) A conical clutch has a cone angle of 30 degree. if the maximum intensity of pressure between the contact surface is limited to 70 kpa and width of conical surface is not to exceed $\frac{1}{3}$ rd of the mean radius. Find dimension of the contact surfaces to transmit 22 kw at 2000 rpm assuming uniform wear (take coefficient of friction as 0.15) **07**
- Q.2** (a) Explain instantaneous centre method for finding out the velocity of a point on link. **07**
- (b) The crank of oscillating cylinder engine mechanism is 50 mm long and it rotates at 300 rpm. The piston rod is 150mm long and distance between crank shaft and trunnion is 250mm. Draw velocity and acceleration diagram at the instant when crank is at 60 degree from IDC. And determine
1. velocity and acceleration of sliding piston.
 2. Angular velocity of a connecting rod.
 3. Sliding acceleration of a piston relative to cylinder walls.
- OR**
- (b) The crank of a reciprocating engine is 10 cm long and it rotates at a uniform speed of 20 rad/sec clockwise. The connecting rod length is 40 cm. Determine the velocity and acceleration of the piston and angular velocity and angular acceleration of the connecting rod when crank is at 0 degree and 135 degree from IDC. Use Klein's construction method. **07**
- Q.3** (a) A universal joint is used to connect two shafts which are inclined at 20 degree and the speed of the driving shaft is 1500 rpm. Find extreme angular velocity of the driven shaft and its maximum acceleration. **07**
- (b) State and explain Grashof's criterion **07**
- OR**
- Q.3** (a) A Hook's joint is used to connect two shafts inclined at an angle 20 degree. Find maximum and minimum velocity of driven shaft and the angles of which the driven shaft will have the same speed as that of the driving shaft which rotates at 240 rpm. **07**
- (b) Explain degree of freedom with neat sketch. Also explain Grubler's criterion. **07**
- Q.4** (a) Derive expression for length of belt for cross belt drive **07**
- (b) A casting having mass of 1000 kg is suspended freely from rope. The rope makes 2 turns round a drum 300 mm dia rotating at 24 rpm. The outer end of rope is pulled by man. Calculate the force required by the man, total power to raise the casting and power supplied by drum run by prime mover and by man. **07**
- OR**
- Q.4** (a) Derive the expression for limiting tension ratio in case of flat belt drive. **07**
- (b) Two parallel shaft 6m apart are to be connected by a belt running over a pulley of dia 600 mm and 400 mm respectively. Find exact and approx lengths of belt when belt is open and when belt is crossed. **07**

- Q.5 (a)** Determine the minimum no of teeth required on pinion and wheel to avoid interference when gear ratio is 3 and when number of teeth on pinion and wheel is equal (take pressure angle = 20 and addendum of wheel is 1 module.) **07**
- (b)** A two start worm rotating at 600 rpm drives a worm gear having 22 teeth. The PCD is 65mm and pitch of 18mm. If coefficient of friction is 0.06. Find helix angle of worm, max efficiency, and centre distance. **07**

OR

- Q.5 (a)** A cam operates a flat faced follower which moves with cycloidal motion during ascent and descent. The further specifications are: **07**
Min radius of cam = 30 mm Angle of ascent = 120 Angle of dwell = 60
Lift of follower = 40 mm Angle of descent = 90 speed of cam = 300 rpm
Draw cam profile. Find max velocity and acceleration during ascent and descent.
- (b)** Distinguish between the function of a clutch, brake and dynamometer. Derive relation for ratio of tension in the tight side and slack side of band and block **07**
