Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – SUMMER • 2014

Subject Code: 141902 **Date: 23-06-2014**

Subject Name: Kinematics of Machines

Time: 10:30 am - 01:00 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)**	Discuss with neat sketch different types of steering gear mechanism of automobile in detail.	**07**
	(b)	Explain "The common normal at the point of contact between a pair of teeth must always pass through the pitch point"	**07**
Q.2	**(a)**	Explain various inversion of a slide-crank mechanism with the help of example.	**07**
	(b)	Explain Hart straight line motion mechanism with the help of neat sketch and prove that tracing point describes a straight line path.	**07**
		OR	
	(b)	Derive analytical expression for the displacement and velocity analyses of a slider crank mechanism.	**07**
Q.3	**(a)**	Define Clutch. Explain with neat sketch, working of a clutch generally used in commercial four wheel drive.	**07**
	(b)	Two shafts whose centres are 1 m apart are connected by a V-belt drive. The driving pulley is supplied with 100 kW and has an effective diameter of 300 mm. It runs at 1000 r.p.m. while the driven pulley runs at 370 r.p.m. The angle of groove on the pulleys is 40. The permissible tension in 400 mm cross-sectional area belt is 2.1 MPa. The density of the belt is 1100 kg/m. The coefficient of friction between the belt and pulley is 0.28. Estimate the number of belts required.	**07**
		OR	
Q.3	**(a)**	What are different types of chains? Explain with neat sketches, the power transmission chains.	**07**
	(b)	A multiple disc clutch transmits 75 kW of power at 2000 rpm. Coefficient of friction for the friction surfaces is 0.2. Axial intensity of pressure is not to exceed 180 kN/m^2. Internal radius is 100 mm and is 0.8 times the external radius. Find the number of plates needed to transmit the required torque. Assume uniform wear conditions.	**07**
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**
		OR	
Q.4	**(a)**	Explain degree of freedom with neat sketch. Also explain Grumbler's criterion.	**07**
	(b)	Two mating involute spur gear of 20 degree 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**

Q.5	**(a)**	Classify followers and explain with neat sketch.	**07**
	(b)	Draw a cam profile to drive an oscillating roller follwer to the specifications given below. (1)Follower to move outwards through an angular displacement of 20º during the first 120 rotation of the cam; (2)Follower to return to its initial position during next 120º rotation of the cam. (3)Follower to dwell during the next 120º of cam rotation. The distance between pivot centre and roller centre=120mm;distance between Pivot centre and cam axis =130mm;minimum radius of cam=40mm;radius of roller=10mm Inward and outward strokes take place with simple harmonic motion.	**07**

OR

Q.5	**(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)	Differentiate between overhauling and self locking of screw.	**07**

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