Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV EXAMINATION – SUMMER 2016

Subject Code:141902 **Date:08/06/2016**

Subject Name:Kinematics Of Machines

Time:10:30 AM to 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)**	Sketch and explain the various inversions of a slider crank chain.	**07**
	(b)	Explain Grubler's criterion for determining degree of freedom for mechanisms.	**07**
Q.2	**(a)**	In a slider crank mechanism, the lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. The crank is 45^0 from IDC position and rotates clockwise with a uniform speed of 96 rpm. Locate all the instantaneous centres of the mechanism and find: (1) Velocity of the slider A (2) Angular velocity of the connecting rod AB.	**07**
	(b)	Derive an expression for the magnitude and direction of coriolis component of acceleration.	**07**
		OR	
	(b)	Explain the kinematic analysis of I.C. engine mechanism by Klien's construction when the angular velocity of crank is uniform.	**07**
Q.3	**(a)**	Following data is given for a rope pulley transmitting 24 kW : Diameter of pulley = 400 mm, Speed = 110 R.P.M., Angle of groove = 45^0, Angle of lap on smaller pulley = 160^0, Coefficient of friction = 0.28, Number of ropes = 10, Mass in kg/m length of ropes = $53C^2$ and working tension is limited to $122C^2$ KN, where C is girth of rope in metres. Find initial tension and diameter of each rope.	**07**
	(b)	Explain with neat sketches, the classification of power transmission chains.	**07**
		OR	
Q.3	**(a)**	An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3 metres apart and transmits 4 kW from the smaller pulley that rotates at 300 R.P.M. Coefficient of friction between the belt and the pulley is 0.3 and the safe working tension is 10N per mm width. Determine: (1) minimum width of the belt (2) initial belt tension (3) length of the belt required.	**07**
	(b)	Derive an expression for ratio of driving tensions for a V-belt drive.	**07**
Q.4	**(a)**	Two involute gears of 20^0 pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module. Find: 1. The angle turned through by pinion when one pair of teeth is in mesh 2. The maximum velocity of sliding.	**07**
	(b)	Explain the interference in involute gears. How interference should be prevented?	**07**
		OR	
Q.4	**(a)**	The cutter of a broaching machine is pulled by square threaded screw of 55mm	**07**

external diameter and 10mm pitch. The operating nut takes the axial load of 400 N on a flat surface of 60 mm internal diameter and 90 mm external diameter. If the coefficient of friction is 0.15 for all contact surfaces on the nut, determine the power required to rotate the operating nut, when the cutting speed is 6 m/min.

(b) Describe the construction and working of a centrifugal clutch. **07**

Q.5 **(a)** Draw the displacement, velocity and acceleration diagrams for a follower when it moves with (i) Uniform Velocity (ii) Simple Harmonic Motion **07**

(b) Design a profile of cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60^0 of cam rotation. The valve must remain in the fully open position for 20^0 of cam rotation. **07**

The lift of the valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is provided with a roller of radius 20 mm and its line of stroke passes through the axis of the cam.

OR

Q.5 **(a)** What is over hauling and self-locking screws? Derive an expression for efficiency of self-locking screws. **07**

(b) Explain the various types of gear trains. **07**

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