Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2142504 Date:12/12/2018

Subject Name:Theory of Machines

Time: 02:30 PM TO 05:00 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)**	Explain any ONE inversion of single slider crank chain.	**03**
	(b)	Sketch the Ackermann steering gear with labeling. Give the reason why the Ackermann steering gear, which does not satisfy the condition for gearing in all positions, is preferred to the Davis steering gear?	**04**
	(c)	Write the names of all the inversions of a four bar chain mechanism.	**07**
Q.2	**(a)**	Define flexible link & give its example.	**03**
	(b)	Differentiate between completely constrained motion and incompletely constrained motion.	**04**
	(c)	Draw pantograph mechanism with proportions of links shown and state it applications.	**07**
		OR	
	(c)	Explain Crank and slotted-lever Mechanism	**07**
Q.3	**(a)**	State the condition for correct steering gear ratio.	**03**
	(b)	What is the advantage of crowning of pulleys?	**04**
	(c)	Draw & explain Peaucellier mechanism with condition to fulfill its motion type.	**07**
		OR	
Q.3	**(a)**	State major applications of Hooke's joint.	**03**
	(b)	Explain velocity by Instantaneous Centre Method.	**04**
	(c)	State the motions imparted to a follower by a cam and sketch the displacement- time diagrams for each motion type.	**07**
Q.4	**(a)**	What is the advantage of crowning of pulleys?	**03**
	(b)	State different types of rope drives. What are the advantages & limitations of rope drives over other drives?	**04**
	(c)	Derive an expression for total length of belt for a cross belt drive with usual notations.	**07**
		OR	
Q.4	**(a)**	What is centrifugal tension in a belt? How does it affect the power transmitted?	**03**
	(b)	In the context of synthesis differentiate between structural error and mechanical error.	**04**
	(c)	The crank and connecting rod of a theoretical steam engine are 0.5 and 2 m long respectively. The crank makes 180 r.p.m. in the clockwise direction. When it has turned 45° from the inner dead centre position, determine:1. Velocity of piston, 2. Angular velocity of connecting rod, 3. Velocity of point E on the connecting rod 1.5 m from the gudgeon pin, 4. velocities of rubbing at the pins of the crank shaft, crank and crosshead when the diameters of their pins are 50 mm, 60 mm and 30 mm respectively, 5. Position and linear velocity of any point G on the connecting rod which has the least velocity relative to crank shaft.	**07**

Q.5	**(a)**	Classify chains and draw the sketch of each class.	**03**
	(b)	Despite of one disadvantage Involute teeth profile is preferred for manufacturing gears above cyclical teeth profile. Why?	**04**
	(c)	The number of teeth of a spur gear is 30 and it rotates at 200 rpm. What will be its circular pitch and the pitch line velocity if it has a module of 2 mm?	**07**

OR

Q.5	**(a)**	Differentiate between self energizing brakes and self locking brake.	**03**
	(b)	With the usual notation prove that product of circular pitch and diametral pitch is π.	**04**
	(c)	Draw the profile of a cam operating a roller reciprocating follower and with the following data: Minimum radius of cam = 25 mm Lift = 30 mm Roller diameter = 15 mm The cam lifts the follower for 120 degree with SHM followed by a dwell period of 30 degree. Then the follower lowers down during 150 degree of the cam rotation with uniform acceleration and deceleration followed by dwell period. If the cam rotates at a uniform speed of 150 rpm. Calculate the maximum velocity and acceleration of the follower during the descent period.	**07**

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