Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV EXAMINATION – WINTER 2015

Subject Code: 141902 **Date:04/01/2016**

Subject Name: Kinematics of Machines

Time: 02:30pm to 05:00pm **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)**	Define: Kinematic link, Kinematic chain, Mechanism, Degrees of freedom, Lower pair, Higher pair, Inversion.	**07**
	(b)	What is the condition for correct steering? Sketch and explain any one type of steering mechanism with its advantages.	**07**
Q.2	**(a)**	What are straight line mechanisms? Describe one type of exact straight line motion mechanism with the help of a sketch.	**07**
	(b)	Explain with a neat sketch the "Differential gear box".	**07**
		OR	
	(b)	Explain various inversion of a slider-crank mechanism with the help of sketch.	**07**
Q.3	**(a)**	State and prove the law of gearing.	**07**
	(b)	Two 20^0 involute spur gear mesh externally and give a velocity ratio of 3. The module is 3 mm and the addendum is equal to 1.1 modular. If the pinion rotates at 120 rpm, Determine: (1) Minimum number of teeth on each wheel to avoid interference (2) Contact ratio.	**07**
		OR	
Q.3	**(a)**	What is gear train? Give classification of it and Explain reverted gear train with sketch also define its velocity ratio.	**07**
	(b)	Two shafts A and B are co-axial. Gear C (50teeth) is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 rpm find the speed of shaft B.	**07**
Q.4	**(a)**	The mean diameter of a square threaded screw jack is 50 mm. The pitch of the thread is 10 mm. The coefficient of friction is 0.15. What force must be applied at the end of a 0.7 m long lever, which is perpendicular to the longitudinal axis of the screw to raise a load of 20kN and to lower it?	**07**
	(b)	Describe with a neat sketch the working of a single plate clutch.	**07**
		OR	

Q.4 A cam is to be designed for a knife edge follower with the following data: **14**

1. Cam lift=40 mm during 90^0 of cam rotation with SHM.
2. Dwell for the next 30^0.
3. During the next 60^0 of cam rotation, the follower returns to its original position with SHM.
4. Dwell during the remaining 180^0.

Draw the cam profile when the line of stroke is offset 20 mm from the axis of the cam shaft.

The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 rpm.

Q.5 (a) State the criteria of selection of following for transmission of power: **07**

1. Belt Drive 2. Rope Drive 3. Chain Drive 4. Gear Drive

(b) A casting weighing 9 kN hangs freely from a rope which makes 2.5 turns round a drum of 300 mm diameter revolving at 20 rpm. The other end of the rope is pulled by a man. The coefficient of friction is 0.25. Determine: (1) The force required by a man (2) The power to raise the casting. **07**

OR

Q.5 (a) In a four bar chain ABCD, AD is fixed link. Crank AB rotates in clock wise direction at an angular velocity of 10 rad/sec. Link AB=60 mm, BC=CD=70 mm, DA=120 mm. When angle DAB=60^0 and the points B and D are on one side of the link AD, Find angular velocity of link BC and link CD. **07**

(b) Describe Klein's construction with an example. **07**

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