Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code:2142001 **Date:30/12/2015**

Subject Name: KINEMATICS & DYNAMICS OF MACHINES

Time: 2:30pm to 5:00pm **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)**	Sketch the crank slider chain and its various inversions, stating actual machines in which these are used in practice.	**07**
	(b)	Draw the velocity diagram of crank and slotted lever mechanism. Select proper dimensions and rotation speed of the crank.	**07**
Q.2	**(a)**	State the Kennedy's theorem of three instantaneous centers. Explain the method to find all possible I- centers of four bar mechanism and velocity of each link.	**07**
	(b)	Discuss how a single revolving mass is balanced by two masses revolving in different planes.	**07**
		OR	
	(b)	Explain the method of balancing of different masses revolving in same plane.	**07**
Q.3	**(a)**	How the velocity ratio of epicyclic gear train is obtained by tabular method?	**07**
	(b)	An open belt drive connects two pulleys 1.2 m and 0.5 m diameter, on parallel shafts 4 m apart. The mass of the belt is 0.9 kg per meter length and the maximum tension is not to exceed 2000 N. The coefficient of friction is 0.3. The 1.2 m pulley, which is driver, runs at 200 rpm. Due to belt slip on one of the pulley, the velocity of the driven shaft is only 450 rpm. Calculate the torque on each of the two shafts, the power transmitted, and power lost in friction. What is the efficiency of the drive?	**07**
		OR	
Q.3	**(a)**	Two gears in mesh have module of 8 mm and a pressure angle of 20°. The larger gear has 57 teeth while the pinion has 23 teeth. If the addenda on pinion and gear wheels are equal to one module, find 1. the number of pairs of teeth in contact 2. the angle of action of the pinion and gear wheel 3. the ratio of sliding to rolling velocity at (a) the beginning of contact (b) the pitch point (c) the end of contact	**07**
	(b)	Derive the expression for the ratio of belt tension in V-belt drive.	**07**
Q.4	**(a)**	The following data relate to a cam operating an oscillating roller follower: Minimum radius of cam = 44 mm, Diameter of roller = 14 mm, length of the follower arm = 40 mm, distance of fulcrum center from cam center = 50 mm, angle of ascent = 75°, angle of descent = 105°, angle of dwell for follower in the highest position = 60°, angle of oscillation of follower is 28°. Draw the cam if the ascent and descent both take place with SHM.	**07**
	(b)	Describe the gyroscopic effect on four wheeled vehicle when taking turn.	**07**
		OR	

Q.4	**(a)**	What are the different type of motion with which the follower can move? Draw the displacement, velocity and acceleration diagrams for follower for any two types of motions,	**07**
	(b)	A uniform disc of 150 mm diameter has a mass of 5 kg. It is mounted centrally in bearings which maintain its axle in a horizontal plane. The disc spins about axle with a constant speed of 1000 rpm (anticlockwise looking from right end bearing). While the axle precesses uniformly about the vertical at 60 rpm (anticlockwise looking from top). If the distance between the bearings is 100 mm, find the resultant reaction at each bearing due to mass and gyroscopic effect.	**07**
Q.5	**(a)**	Determine (a) critical damping coefficient (b) damping factor (c) the natural frequency of damped vibrations (d) the logarithmic decrement and (e) ratio of two consecutive amplitudes of a vibrating system which consists of a mass 25 kg, a spring stiffness 15 kN/m and a damper. The damping provided is only 15% of critical value.	**07**
	(b)	Define and explain the terms: vibrations, free vibration, forced vibration and damped vibration.	**07**

OR

Q.5	**(a)**	Derive the expression to find the natural frequency of longitudinal vibration of spring mass system.	**07**
	(b)	For a vibrating system with viscous damping, the mass of vibrating body is 3.75 kg and the stiffness of spring is 4.5 N/mm. if the amplitude decreases to 0.33 of the initial value after four consecutive cycles, find the value of damping coefficient of damper in the system.	**07**

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