Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV EXAMINATION – SUMMER 2016

Subject Code:142001 **Date:03/06/2016**

Subject Name:Kinematics And Dynamics 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)**	Explain various inversions of a slider-crank mechanism with neat sketches.	**07**
	(b)	What is Pentograph? Explain its function & Applications.	**07**
Q.2	**(a)**	Explain Grubler's criterion for determining degree of freedom for mechanism.	**07**
	(b)	Draw profile of a cam operating a roller reciprocating follower having a lift of 35 mm. The line of stroke of the follower passes through the axis of the cam shaft. The least radius of the cam is 40 mm. Roller radius is 10 mm. Cam rotates at 630 rpm counter-clockwise with following follower motion. Follower is raised with SHM for 90º of cam rotation. Follower dwells for next 60º of cam rotation. Follower lowers with uniform acceleration and deceleration for next 150º of cam rotation. The follower dwells for rest of the cam rotation.	**07**
		OR	
	(b)	What is cam? What is function of cam? Explain with neat sketch different Types of cams.	**07**
Q.3	**(a)**	Discuss briefly the effect of Gyroscopic Couple and Centrifugal Couple on stability of four wheeled vehicle negotiating a curve.	**07**
	(b)	Differentiate the following with suitable example & neat sketches. (I) Lower & Higher Pairs (II) Closed & unclosed pairs (III) Machine & Structure	**07**
		OR	
Q.3	**(a)**	Sketch two teeth of a gear and show the following: face, flank, top, land, bottom land, addendum, dedendum, tooth thickness, space width, face width, circular pitch.	**07**
	(b)	A Ship is propelled by the turbine rotor of a ship has a mass of 6 tones and rotates at 2400 rpm. The direction of rotation of the rotor is clockwise when viewed from the stern. The radius of gyration of rotor is 450 mm. Determine the gyroscopic couple and its effect when (1) The ship turns to left at a radius of 60 m with a speed of 18 knots. (1 knots = 1860 m/h) (2) Ship pitches 7.5 degree above and 7.5 degree below the normal position and bow is descending with its maximum velocity, the pitching motion is simple harmonic with a periodic time of 18 seconds.	**07**
Q.4	**(a)**	Derive the expression for the exact and approximate lengths of belt in an open belt drive.	**07**
	(b)	Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the	**07**

coefficient of friction between the belt and pulley is 0.25?

OR

Q.4	**(a)**	Define the terms "Static balancing" and "Dynamic balancing". State the necessary conditions to achieve them.	**07**
	(b)	A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100 0 and that between the masses at B and A is 190 0, both being measured in same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, Determine: (1) The magnitude of the masses at A and D (2) The distance between planes A and D and (3) The angular position of mass at D.	**07**
Q.5	**(a)**	With neat schematic diagrams explain different types of gear trains.	**07**
	(b)	Give detailed classification of followers and explain each with neat schematic diagrams.	**07**

OR

Q.5	**(a)**	A spring-mass system has spring stiffness 'k', N/m and a mass of 'm', kg. It has natural frequency of vibration as 20 Hz. An extra 5 kg mass is coupled to 'm' and the natural frequency reduced by 3 Hz. Find the value of 'k' and 'm'.	**07**
	(b)	Derive the condition for maximum power transmitted by a belt drive considering the effect of centrifugal tension.	**07**

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