Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER IV • EXAMINATION – SUMMER 2015

Subject Code: 142001 **Date: 01/06/2015**

Subject Name: Kinematics and Dynamics of Machines

Time: 10.30am-01.00pm **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)** Explain Grubler's criterion for determining degree of freedom for mechanism **(07)**

(b) Differentiate the following with suitable example & neat sketches. **(07)**
(I) Lower & Higher Pairs (II) Closed & unclosed pairs (III) Machine & Structure

Q.2 **(a)** A cam with a minimum radius of 25 mm is to be designed for a Knife edge follower data: **(07)**
a) To rise the follower through 35 mm during 60° rotation of the cam.
b) Dwell for the next 40° of the cam rotation
c) Descending of the follower during the next 90° of the cam rotation
d) Dwell during the rest of the cam rotation.
Draw the profile of the cam if the ascending and descending of the cam is with simple harmonic motion and the line of the stroke of the follower is offset 10 mm from the axis of the shaft.
What is maximum velocity and acceleration of the follower during ascent and descent if the cam rotates at 150 rpm.

(b) Describe graphical method to determine velocity and acceleration of four bar mechanism. **(07)**

OR

(b) PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ = 62.5 mm ; QR = 175 mm ; RS = 112.5 mm ; PS = 200 mm . The crank PQ rotates at 10 rad/s clockwise. Draw the Velocity and Acceleration diagram when angle QPS =60° and Q and R lie on the same side of PS. Find the angular Acceleration of links QR and RS. **(07)**

Q.3 **(a)** Give detailed classification of follower and explain each neat schematic diagram. **(07)**

(b) Explain the effect of gyroscopic couple on two wheeler. **(07)**

OR

Q.3 **(a)** The mass of the turbine rotor of ship is 20 tones and has a radius of gyration of 0.60 m. Its speed is 2000 rpm. The ship pitches 6° above and 6° below the horizontal position. A complete oscillation takes 30 seconds and the motion is simple harmonic. **(07)**
Determine:
1.Maximum Gyroscopic couple
2.Maximum angular acceleration of the ship during pitching
3. The direction in which the bow will tend to turn when rising, if the rotation of the rotor is clockwise when looking from the left.

(b) Derive a relation for minimum number of teeth on gear wheel and the pinion to avoid interference. **(07)**

Q.4	**(a)**	Sketch two teeth of a gear and show the following : Addendum, Dedendum, Tooth Thickness, Space Width, circular pitch, Module, Diameter pitch	**(07)**
	(b)	A single V –belt is used to transmit the power from a grooved pulley of pitch diameter 200 mm running at 1500 rpm to a flat pulley of diameter 600 mm. The center distance between the pulleys is 1000 mm. The mass of a belt is 0.3 kg/meter. The coefficient of friction between the belt and pulley is 0.25. The V-belt pulley grooves angle is 38°. If the allowable tension is 800N Determine: (I)The Power transmitting of the belt (II)The initial tension required in the belt.	**(07)**

OR

Q.4	**(a)**	Derive the condition for maximum power transmitted by a belt drive considering the effect of centrifugal tension.	**(07)**
	(b)	An epicyclic train is composed of fixed annular wheel a having 150 teeth. Meshing with A is wheel B Which drives wheel D through and idle wheel C, Wheel D being concentric with A. Wheel B and C are carried on an arm E which resolves clockwise at 100 rpm about the axis of A and D. If the wheel B and D have 25 and 40 teeth respectively, find the number of teeth on C and sense of rotation of C. Also sketch the arrangement.	**(07)**
Q.5	**(a)**	Explain the procedure for balancing of several masses in different planes.	**(07)**
	(b)	A circular disc mounted on a shaft carries three attached masses 4 Kg, 3 Kg and 2.5 Kg at radial distances 75 mm, 85 mm and 50 mm and at the angular position of 45°, 135° and 240° respectively. The angular positions are measured counter clockwise from the reference line along x-axis Determine the amount of the counter mass at a radial distance of 75 mm required for the static balance	**(07)**

OR

Q.5	**(a)**	Explain the terms: i) Natural frequency ii) Damping iii) logarithmic decrement iv) Vibration isolation	**(07)**
	(b)	Define vibration. With neat schematic diagrams explain free vibration, forced vibration, undamped vibration and damped vibration.	**(07)**

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