

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023

Subject Code:3142006

Date:19-07-2023

Subject Name:Analysis of Mechanisms

Time:10:30 AM TO 01:00 PM

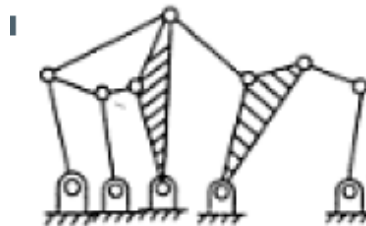
Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

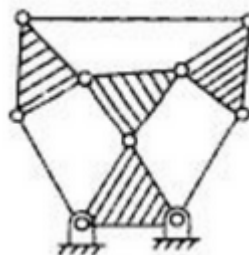
- Q.1 (a) Define Kinematic link and Kinematic pair giving example. 03
(b) Explain any two inversions of four bar chain. 04
(c) What is an instantaneous center of rotation for the body? For a slider crank mechanism, how are they found? Explain giving related sketches and equation. 07

- Q.2 (a) What is Coriolis component of acceleration? How is it determined? 03
(b) What are the centripetal and centrifugal components of acceleration? When do they occur? How are they determined? 04
(c) For the kinematic linkage shown in figure below, calculate - 07
(1)number of binary, ternary, other links (2)number of total links (3)number of loops, joints or pairs, degree of freedom



OR

- (c) For the kinematic linkage shown in figure below, calculate - 07
(1)number of binary, ternary, other links (2)number of total links (3)number of loops, joints or pairs, degree of freedom .



- Q.3 (a) With neat sketch explain (i)Circular pitch(ii)Space width(iii)Tooth thickness 03
(b) Classify the gears according to the relative positions of their shaft axes. 04
(c) A belt drive is required to transmit 10 KW from a motor running at 600 rpm.The belt is 12 mm thick and has a mass density of 0.001 g/mm^3 .Safe 07

stress in the belt is not to exceed 2.5 N/mm^2 . The diameter of the driving pulley is 250 mm, whereas the speed of the driven pulley is 220 rpm. The two shafts are 1.25 m apart. The coefficient of friction is 0.25. Determine the width of the belt.

OR

- Q.3** (a) Explain crowning of pulley with neat sketch. **03**
 (b) Differentiate between open and cross belt drive. **04**
 (c) Following data relate to two meshing involute gears. **07**

Number of teeth on gear wheel = 60, Pressure Angle = 20 degrees, Gear ratio = 1.5, Speed of the gear wheel = 100 rpm, Module = 8 mm

The addendum on each wheel is such that the path of approach and the path of recess on each side are 40 % of the maximum possible length each. Determine the addendum for the pinion and the gear and the length of arc of contact.

- Q.4** (a) Differentiate between static and dynamic balancing. **03**
 (b) With neat sketch explain how the displacement diagrams for (i) SHM and (ii) Constant acceleration and deceleration when follower rises through 50 mm and cam turns through an angle of 90 degrees. **04**
 (c) Each wheel of a motorcycle is of 600 mm diameter and has a moment of inertia of 1.2 Kg m^2 . The total mass of the motorcycle and the rider is 180 kg and the combined center of mass is 580 mm above the ground level when the motor cycle is upright. The moment of inertia of the rotating parts of the engine is 0.2 Kg m^2 . The engine speed is 5 times the speed of the wheels and is in the same direction/sense. Determine the angle of heel necessary when the motorcycle takes a turn of 35 m radius at a speed of 54 kmph. **07**

OR

- Q.4** (a) Derive the equation for gyroscopic couple. **03**
 (b) How are followers classified according to the location of line of movement? Give sketches. **04**
 (c) 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 positions of 45, 135 and 240 degrees respectively. The angular positions are measured counterclockwise 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. Solve analytically. **07**

- Q.5** (a) Explain kinds of friction. **03**
 (b) State the laws of friction. **04**
 (c) Derive the equation for natural frequency of a single spring mass system using equilibrium method. **07**

OR

- Q.5** (a) What are the basic elements of a vibrating system? Explain. **03**
 (b) Explain the types of vibrations giving examples. **04**
 (c) Explain types of brakes with neat sketches. **07**
