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PRESIDENCY UNIVERSITY BENGALURU

 **SET-A**

SCHOOL OF ENGINEERING

**END TERM EXAMINATION – MAY/JUNE 2024**

**Semester :** Semester IV - 2022

**Course Code :** MEC4002

**Course Name :** - Kinematics of Machines

**Program :** B.Tech.

**Date :** June 21, 2024

**Time :** 9:30 AM - 12:30 PM

# Max Marks : 100

**Weightage :** 50%

# Instructions:

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

**PART A**

**ANSWER ANY FIVE QUESTIONS 5QX2M=10**

1. Define Grashof's law

(CO1) [Knowledge]

1. A planar mechanism has 8 links and 10 rotary joints. The number of degrees of freedom of the mechanism, using Grubler's criterion, is
2. Define a higher pair with suitable diagram.
3. Define a lower pair with suitable diagram.
4. What is a coriolis component in an Acceleration analysis?
5. Define pressure angle in a cam profile.
6. Explain the importance of a roller follower over a knife-edge follower.

(CO1) [Knowledge] (CO2) [Knowledge] (CO2) [Knowledge] (CO3) [Knowledge] (CO4) [Knowledge] (CO4) [Knowledge]

**PART B**

**ANSWER ANY FIVE QUESTIONS 5QX10M=50**

1. The degree of freedom of a planar mechanism can be calculated by various means, identify any 1 method for the calculation of degree of freedom and also explain the same.

(CO1) [Comprehension]

1. Identify all the inversions for a Single Slider Crank Mechanism and draw any 2 mechanisms used as a Quick return Mechanism.

(CO2) [Comprehension]

1. The Kennedy theorem is used for calculating the instantaneous centers of the links. Assume a 4-link Mechanism with links namely 1,2 ,3, and 4. Link 1 is fixed and the length of link 1 and link 2 is b units. If link 2 is moving with an angular velocity of 20 rad/sec and the angle between link 1 and link 2 is 180 degrees at any instant. Identify the angular velocity of link 3 using the Kennedy theory.

(CO3) [Comprehension]

1. There is a need to reduce the Interference between a gear and a pinion while transmitting power. Identify any 4 ways by which interference may be reduced in the gears with a brief explanation.

(CO4) [Comprehension]

1. A gear must have a constant velocity ratio to transmit the power between 2 shafts in a mechanism. Law of gearing governs the above statement,Explain law of gearing with neat sketch in your own words.

(CO4) [Comprehension]

1. The link AB is in a general motion of rotation and translation simultaneously.Define Instantaneous center in a Mechanism and identify all the Instantaneous centers in a 4-bar link mechanism. Assume any Mechanism of your choice to locate the Instantaneous centers.

(CO3) [Comprehension]

1. Assume any gear of your choice and With a neat diagram briefly explain any 5 terminology used for a Gear.

(CO4) [Comprehension]

**PART C**

**ANSWER ANY TWO QUESTIONS 2QX20M=40**

1. The dimensions and configuration of the four bar mechanism are needed for velocity and acceleration analysis. Draw the configuration diagram as follows if P1 and P2 are fixed: P1A = 300 mm; P2B = 360 mm; AB = 360mm, and P1P2 = 600 mm. The angle AP1P2 = 60°. The crank P1A has an angular velocity of 10 rad/s, clockwise. Determine the angular velocities of P2B, and AB and the velocity of the joint B.

(CO1) [Application]

1. A follower follows the constant velocity profile and is in line with the base circle. The maximum lift for the follower is 30 mm. It has an Ascent for the 60 degrees and a dwell for the next 20 degrees and again the descent is for 60 degrees. Assuming suitable parameters construct the cam profile talked about in the above statements.

(CO4) [Application]

1. A Gear train is represented as follows to transmit the power. The Ring Gear has 72 teeth and contains 3 Planetary Gears connected by an Arm or Carrier and a Sun Gear at the center. The speed of the arm is 5 times the speed of the Planetary Gear and Assume the rpm of the planetary gear as zero. Calculate the no of teeth in planetary gear and Sun gear.

(CO5) [Application]