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## INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
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## II B.Tech II Sem Supply End Examination, July 2022
## Kinematics of Machinery
(MECH)

Time: 3 Hours.                                                    Max. Marks: 70

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

## PART- A
(10*2 Marks = 20 Marks)

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|---|---|---|---|---|---|
| 1. | a) | Differentiate between (i)Lower pairs and Higher pairs.(ii) rolling pair and spherical pair | 2M | CO1 | BL1 |
| | b) | What is inversion of a mechanism? List out inversions of Single slider crank chain. | 2M | CO1 | BL2 |
| | c) | What is Coriolis component of acceleration? Write any two mechanisms where Coriolis component exists. | 2M | CO2 | BL2 |
| | d) | Define instantaneous centre and write properties of instantaneous centres. | 2M | CO2 | BL1 |
| | e) | What is the use of universal coupling? Write applications of universal coupling. | 2M | CO3 | BL2 |
| | f) | List out Straight line motion mechanisms | 2M | CO3 | BL2 |
| | g) | Define the following with reference to a cam. (i)Lift (ii) Base circle (iii) Pressure angle (vi) Pitch point | 2M | CO4 | BL1 |
| | h) | In a cam and follower, the follower moves with uniform velocity during ascent. Lift of the follower is 50mm .Angle of ascent is $100^0$. Angular velocity of cam is 10 rad/sec . Determine the magnitude of velocity of follower during ascent. | 2M | CO4 | BL3 |
| | i) | Define the following with reference to gears (i)Circular pitch (ii)Addendum (iii)Tooth thickness (iv) Pitch point. | 2M | CO5 | BL1 |
| | j) | Distinguish simple and compound gear train with a neat sketch. | 2M | CO5 | BL3 |

## PART- B
(10*5 Marks = 50 Marks)

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| 2 | a) | Explain various types of constrained motions | 6M | CO1 | BL2 |
| | b) | In a crank and slotted lever quick return mechanism, the distance between the fixed centers is 240mm and the length of the driving crank is 120mm. Find the inclination of the slotted bar with the vertical in the extreme position and the time ratio of cutting stroke to the return stroke. If the length of the slotted bar is 450 mm, find the length of stroke if the line of stroke passes through the extreme positions of the free end of the lever. | 4M | CO1 | BL3 |

OR

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| 3 | | Define Kinematic pair and explain various types of kinematic pairs with examples. | 10M | CO1 | BL2 |

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| 4 | a) | State and Prove Kenedys theorem. Explain its use. | 7M | CO2 | BL2 |
| | b) | What is Coriolis component of acceleration? Write any two mechanisms where Coriolis component exists. | 3M | CO2 | BL2 |

**OR**

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| 5 | In a slider crank mechanism the crank is 300 mm long and rotates at 100rpm in clockwise direction. Length of connecting rod is 1500mm. when the crank turns through $30^0$ from IDC, determine | 10M | CO2 | BL4 |

      a. Velocity of the slider
      b. Angular velocity of connecting rod.
      c. Acceleration of slider.

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| 6 | a) | Derive the expression for maximum fluctuation of speed of driven shaft of a universal coupling | 3M | CO3 | BL3 |
| | b) | A Hooke's joint connects a shaft running at a uniform speed of 1000 rpm to a second shaft. The angle between their axes being $15^0$. Find the velocity and acceleration of the driven shaft at an instant when the fork of the driving shaft has turned through an angle of $10^0$ from the plane containing the shaft axes.If mass of driven shaft is 10kg and radius of gyration is 30mm determine torque on driven shaft. | 7M | CO3 | BL3 |

**OR**

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| 7 | State and prove the principle of Exact straight line mechanism and explain how exact straight line motion can be obtained in Peaucellar mechanism . | 10M | CO3 | BL2 |

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| 8 | A cam operating a knife edged follower has the following data. | 10M | CO4 | BL3 |

      (i) Follower moves outward through 40mm during $60^0$of cam rotation
      (ii) Follower dwells for next $45^0$
      (iii) Follower returns to its original position in next $90^0$ .
      (iv) Follower dwells for rest of the rotation.
      Displacement of the follower is with SHM both during ascent and descent. Least radius of cam is 50mm.Draw the cam profile

**OR**

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| 9 | Design a cam to raise a valve with uniform velocity through 50mm in 1/3 rd of revolution, keep it fully raised through 1/12 th of a revolution and to lower it with uniform acceleration and retardation, with acceleration equal to retardation, in $1/6^{th}$ of revolution .The valve remains closed during the rest of the revolution. Minimum radius of cam is 25mm, diameter of roller is 20mm.Axis of valve rod passes through cam axis. If the cam shaft rotates at 100rpm find the maximum velocity and acceleration of the rod during rising and lowering. | 10M | CO4 | BL4 |

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| 10 | Derive the expression for length of path of contact of an involute gear | 10M | CO5 | BL3 |

**OR**

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| 11 | What is the use of Differential of automobile? Describe working of Differential of automobile and explain how differential speeds can be obtained? | 10M | CO5 | BL3 |

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