

Code No: 114CY

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech II Year II Semester Examinations, October/November - 2016****KINEMATICS OF MACHINERY****Time: 3 Hours****(Automobile Engineering)****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

Part- A**(25 Marks)**

- 1.a) What do you mean by constrained motion? [2]
- b) What do you mean by a pantograph and what are its uses? [3]
- c) What is the importance of finding acceleration of a various points in a mechanism? [2]
- d) Explain how you determine the various instantaneous centres in a four bar chain? [3]
- e) What is Hooke's joint and explain its importance? [2]
- f) Why a roller follower is preferred to that of a knife-edged follower? [3]
- g) What is the relation between normal pitch, circular pitch and helix angle? [2]
- h) Explain the function of a differential gear in automobiles? [3]
- i) What are different types of chains? Explain. [2]
- j) Explain the phenomena of 'slip' and 'creep' in a belt drive. [3]

Part-B**(50 Marks)**

- 2.a) What are straight line motion mechanisms? Describe one type of exact straight line motion mechanism with the help of a sketch.
- b) What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism? Give examples. [5+5]

OR

- 3.a) Explain different kinds of kinematic pairs giving example for each one of them.
- b) Explain in detail the double slider crank chain and discuss about all the inversions of double slider crank mechanisms. [5+5]

- 4.a) Derive an expression for the magnitude and direction of coriolis component of acceleration.
- b) The crank and connecting rod of a reciprocating engine are 150 mm and 600 mm long respectively. The crank makes an angle of 60° with the inner dead centre, and revolves at a uniform speed of 450 rpm. Find the velocity of the mid-point of the connecting rod by Klein's construction method. [5+5]

OR

- 5.a) Describe the method of drawing the acceleration diagram for a slider crank mechanism.
- b) In a pin jointed four bar mechanism $ABCD$, the lengths of various links are as follows: $AB = 25$ mm; $BC = 87.5$ mm; $CD = 50$ mm and $AD = 80$ mm. The link AD is fixed and the angle $BAD = 135^{\circ}$. If the velocity of B is 1.8 m/s in the clockwise direction, find
 - i) velocity and acceleration of the midpoint of BC , and
 - ii) angular velocity and angular acceleration of link CB and CD . [5+5]

- 6.a) What is the condition for correct steering? Sketch and show the two main types of steering gears and discuss their relative advantages.
- b) What is the method of constructing the profile of a cam? Explain. [5+5]

OR

7. Design a cam to raise a valve with simple harmonic motion through 50 mm in $1/3$ of a revolution, keep it fully raised through $1/12$ revolution and to lower it with harmonic motion in $1/6$ revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and the minimum radius of the cam is 25 mm. The diameter of the camshaft is 25 mm. The axis of the valve rod passes through the axis of the camshaft. If the camshaft rotates at uniform speed of 100 r.p.m. Find the maximum velocity and acceleration of a valve during raising and lowering. [10]

- 8.a) Prove that the velocity of sliding is proportional to the distance of the point of contact from the pitch point.
- b) Two parallel shafts are to be connected by spur gearing. The approximate distance between the shafts is 600 mm. If one shaft runs at 120 r.p.m. and the other at 360 r.p.m., find the number of teeth on each wheel, if the module is 8 mm. Also determine the exact distance apart of the shafts. [5+5]

OR

- 9.a) With the help of a neat sketch, explain the working of a reverted gear train in detail?
- b) Two mating gears have 20 and 40 involute teeth of module 10mm and 20° pressure angle. If the addendum on each wheel is such that the path of contact is maximum and interference is just avoided, find the addendum for each gear wheel, path of contact, arc of contact and contact ratio. [5+5]

- 10.a) Explain what do you understand by 'initial tension in a belt'.
- b) A flat belt, 8 mm thick and 100 mm wide transmits power between two pulleys, running at 1600 m/min. The mass of the belt is 0.9kg/m length. The angle of lap in the smaller pulley is 165° and the coefficient of friction between the belt and pulley is 0.3. If the maximum permissible stress in the belt is 2 MN/m^2 , find:
i) maximum power transmitted ; and ii) initial tension in the belt [5+5]

OR

- 11.a) Derive the condition for transmitting the maximum power in a flat belt drive.
- b) Find the width of the belt, necessary to transmit 7.5 kW to a pulley 300 mm diameter, if the pulley makes 1600 r.p.m and the coefficient of friction between the belt and the pulley is 0.22. Assume the angle of contact as 210° and the maximum tension in the belt is not to exceed 8 N/mm width. [5+5]

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