

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech II Year I Semester Supplementary Examinations June 2019**

**KINEMATICS OF MACHINERY**

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

**UNIT-I**

- 1 a Define Link and Kinematic Pair. 6M  
b Enumerate the Inversions of Double Slider Crank Chain Mechanism. 6M

**OR**

- 2 a Define 'Degrees of Freedom' and Give some examples for kinematics pairs. 6M  
b With the help of a neat sketch explain the working of Whitworth quick return mechanism. 6M

**UNIT-II**

- 3 a Explain Peaucellier Straight line mechanism with neat sketch. 6M  
b Draw and Explain about the Ackermann's Steering Gear Mechanism. 6M

**OR**

- 4 a Derive the condition to be satisfied by a mechanism required to produce an exact straight line motion. 5M  
b Two shafts are connected by a universal joint. The driving shaft rotates at a uniform speed of 1500 r.p.m. Determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100 r.p.m. Also calculate the maximum and minimum speeds of the driven shaft. 7M

**UNIT-III**

- 5 a Define instantaneous centre & instantaneous axis? What are properties of instantaneous centre? 5M  
b The crank and connecting rod of a reciprocating engine are 150 mm and 600 mm long respectively. The crank makes an angle of  $60^\circ$  with the inner dead centre, and revolves at a uniform speed of 300 rpm. Find the velocity of the mid-point of the connecting rod by Klein's construction method. 7M

**OR**

- 6 a What are the different methods are used for finding the velocity? Write the different types of graphical method. 6M  
b State and prove the 'Aronhold Kennedy's Theorem' of three instantaneous centers. 6M

**UNIT-IV**

- 7 a Write short notes on cams and followers.  
b Derive the expressions for displacement, velocity and acceleration for a tangent cam operating on a radial- translating roller follower:  
(i) When the contact is on straight flank, and  
(ii) When the contact is on circular nose.

**OR**

- 8 A cam operating a knife-edged follower has the following data: 12M  
(a) Follower moves outwards through 40 mm during  $60^\circ$  of cam rotation.  
(b) Follower dwells for the next  $45^\circ$   
(c) Follower returns to its original position during next  $90^\circ$   
(d) Follower dwells for the rest of the rotation.

The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of the cam is 50 mm. Draw the profile of the cam when

1. The axis of the follower passes through the cam axis, and
2. The axis of the follower is offset 20 mm towards right from the cam axis. If the cam rotates at 300 r.p.m., determine maximum velocity and acceleration of the follower during the outward stroke and the return stroke.

**UNIT-V**

- 9 a** What is the difference between a simple gear train and a compound gear train? Explain with neat sketches. 5M
- b** Two spur wheels, each having 30 involute profile teeth, are in mesh. The circular pitch is 25 mm, and the pressure angle is  $20^\circ$ . If the arc of contact is to be twice the pitch, determine the minimum addendum of the gear teeth. 7M

**OR**

- 10 a** Distinguish Involute and Cycloidal tooth profiles. 5M
- b** A compound train consists of six gears. The number of teeth on the gears are as follows: 7M
- |                |   |    |    |    |    |    |    |
|----------------|---|----|----|----|----|----|----|
| Gear           | : | A  | B  | C  | D  | E  | F  |
| No. of Teeth : |   | 60 | 40 | 50 | 25 | 30 | 24 |

The gears B and C are on one shaft while the gears D and E are on another shaft. The gear A drives gear B, gear C drives gear D and gear E drives gear F. If the gear A transmits 1.5 kW at 100 rpm, and the gear train has an efficiency of 80%, find the torque on gear F.

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