Printed Pages: 7   NME - 502

(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 2012252   Roll No. [   ]

B.TECH

Regular Theory Examination (Odd Sem-V), 2016-17

KINEMATICS OF MACHINES

Time : 3 Hours   *Max. Marks : 100*

Note : Assume any missing data.

SECTION-A

1. Attempt all parts. All parts carry equal marks. Write
   answer of each part in short.   (10×2=20)

   a) Define the term machine and mechanism.

   b) Define instantaneous centre.

   c) State the condition for a link to experience coriolis
      acceleration.

   d) What is chebyshev spacing?

502/12/2016/4540   (1)   [P.T.O.

NME - 502

e) Name any two types of cams with specified contours.

f) Define pressure angle with respect to cam.

g) Define module of gears and its relation to circular pitch.

h) What are the special advantages of epicyclic gear trains?

i) What are the disadvantages of V-belt drive over flat belt?

j) What is the function of friction clutch?

SECTION - B

Note : Attempt any five questions from this section.

(5×10=50)

2. Sketch and explain any two inversions of single slider crank chain.

3. In a slider crank mechanism, in fig.1. the length of crank OB and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of the connecting rod is 275 mm from the slider A. The crank speed is 600
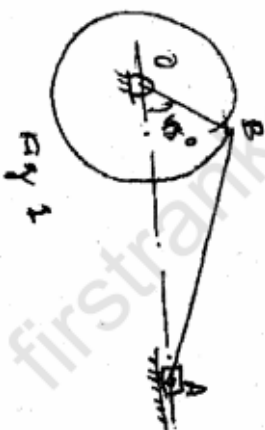
NME - 502

r.p.m. clockwise. When the crank has turned 45° from the inner dead centre position, determine:

a) Velocity of the slider A,

b) Velocity of the point G, and

c) Angular velocity of the connecting rod AB.

4. 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°. If the velocity of B is 1.8m/s in the clockwise direction, find velocity and acceleration of the midpoint of BC,

fig 1

NME - 502

5. What are straight line mechanisms? Describe one type of exact straight line motion mechanism with the help of a sketch.

6. A pinion having 20 involute teeth of module pitch 6mm rotates at 200 r.p.m. and transmits 1.5 kW to a gear wheel having 50 teeth. The addendum on both the wheels is 1/4 of the circular pitch. The angle of obliquity is 20°. Find

   a) The length of the path of approach.

   b) The length of the arc of approach.

   c) The normal force between the teeth at an instant where there is only pair of teeth in contact.

7. Explain with a neat sketch the 'sun and planet wheel.'

8. Explain with sketches the different types of cams and followers.

9. A conical pivot supports a load of 20 kN, the cone angle is 120° and the intensity of normal pressure is not to exceed 0.3 N/mm². The external diameter is twice the

NME - 502

internal diameter. Find the outer and inner radii of the bearing surface. If the shaft rotates at 200 r.p.m. and the coefficient of friction is 0.1, find the power absorbed in friction. Assume uniform pressure.

SECTION - C

Note : Attempt any two questions from this section.

(2×15=30)

10. a) Explain different kinds of kinematic pairs giving example for each one of them.   **(10)**

    b) What is the condition for correct steering? Explain Ackerman steering gear.   **(5)**

11. a) Determine the width of a 9.75 mm thick leather belt required to transmit 15 kW from a motor running at 900 r.p.m. The diameter of the driving pulley of the motor is 300 mm. The driven pulley runs at 300 r.p.m. and the distance between the centres of two pulleys is 3 meters. The density of the leather is 1000 kg/m³. The maximum allowable **stress** in the

leather is 2.5 MPa. The coefficient of friction between the leather and pulley is 0.3. Assume open belt drive and neglect the sag and slip of the belt.(9)

b) Briefly explain the following:

i) Slip of the belt

ii) Creep of the belt. (6)

12. A cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the following motion :

a) Follower to move outwards through a distance of 30 mm during 120° of cam rotation;

b) Follower to dwell for 60° of cam rotation.

c) Follower to return to its initial position during 90° of cam rotation; and

d) Follower to dwell for the remaining 90° of cam rotation.

502/12/2016/14540 (6)

The minimum radius of the cam is 45 mm and the line of stroke of the follower is offset 15 mm from the axis of the cam and the displacement of the follower is to take place with simple harmonic motion on both the outward and return strokes. Draw the cam profile.

502/12/2016/14540 (7)