Code: 13A03401

**R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December 2016

# KINEMATICS OF MACHINERY

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

## PART - A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define the following terms:
(i) Mechanism. (ii) Inversion.

(b) Compare machine and structure.

(c) Explain the conditions for correct steering.

(d) What do you mean by initial tension in the belt? What is the condition for maximum power transmission?

(e) What do you mean by instantaneous centre? What are its properties?

(f) What do you mean by Corioli's component of acceleration?

(g) What do you mean by interference in gears? What are methods to avoid interference?

(h) What do you mean by arc of contact, path of contact and contact ratio?

(i) Write the different types of follower motions.

(j) Explain the application of cam in the mechanisms.

## PART - B

(Answer all five units, 5 X 10 = 50 Marks)

**UNIT - I**

2 Explain any two inversion of a double slider crank mechanism with neat sketches.

**OR**

3 Prove that Peaucellier mechanism traces out an exact straight line motion.

**UNIT - II**

4 Sketch and explain Ackermann's steering gear mechanisms.

**OR**

5 A flat belt is required to transmit 35 kW from a pulley of 1.5 m effective diameter running at 300 rpm. The angle of contact is spread over 11/24 of the circumference and the coefficient of friction between belt and pulley surface is 0.3. Determine width of the belt required taking centrifugal tension into account. It is given that the belt thickness is 9.5 mm, density of its material is 1.1 x $10^3$ kg/$m^3$ and the permissible working stress for the belt is 2.5 N/$mm^2$.

**UNIT – III**

6 A four bar mechanism ABCD is made up of four links, pin jointed at the ends, AD is a fixed link which is 180 mm long. The links AB, BC and CD are 90 mm, 120 mm and 120 mm long respectively. At a certain instant, the link AB makes an angle of 60° with the link AD, if the link AB rotates at uniform speed of 100 rpm clockwise determine:
(a) Angular velocity of the links BC and CD and (b) Angular acceleration of the link CD and CB.

**OR**

7 If the crank and connecting rod are 150 mm and 600 mm long respectively and the crank rotates at a uniform speed of 100 rev/min clockwise, determine: (i) Angular velocity and acceleration of connection rod and (ii) Velocity and acceleration of piston. The angle which the crank makes with the inner dead centre is 30°.



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**UNIT - IV**

8 Two wheels have 24 and 30 teeth and standard addendum equal to one module. If pressure angle is 20°, find the length of the path of contact and length of arc of contact in terms of circular pitch.

**OR**

9 An epicyclic gear train is constructed as follows. A fixed annular wheel A and a smaller concentric wheel B are connected by a compound wheel C & D. C gearing with A, D gearing with B. The compound wheel revolves on a stud which is carried around an arm which revolves about the axis A and B. A has 130 teeth, B = 20 teeth, D = 80 teeth, pitch of A and C being twice that of pitch of B and D. How many revolutions B will make for one revolution of arm.

**UNIT - V**

10 A cam rotating clockwise at uniform speed of 300 rpm operates a reciprocating follower through a roller 15 mm diameter. The follower motion is defined as below;

(a) Outward during 150° with UARM.

(b) Dwell for the next 30°.

(c) Return during next 120° with SHM.

(d) Dwell for the remaining period.

Stroke of the follower is 30 mm. Minimum radius of the cam is 30 mm. Draw the profile of the cam when follower axis passes through the cam axis.

**OR**

11 In a symmetrical tangent cam operating a roller follower, the least radius of the cam is 30 mm and roller radius is 15 mm. The angle of ascent is 60° and the total lift is 15 mm. The speed of the cam shaft is 300 RPM. Calculate (i) The principal dimensions of the cam (ii) the accelerations of the follower at the beginning of the lift. Assume that there is no dwell between ascent and descent.

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