Code: 15A03402

R15

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

KINEMATICS OF MACHINES

(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 degrees of freedom.

(b) Distinguish between lower pair and higher pair.

(c) What are the uses of a pantograph?

(d) What is the condition of correct steering?

(e) Define instantaneous centre of rotation.

(f) What is coriolis acceleration?

(g) Write the condition to avoid minimum number of teeth to avoid interference between gears.

(h) Differentiate between simple and compound gear trains.

(i) List out the types of cams.

(j) State three centers in-line theorem.

PART - B

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

UNIT - I

2 What do you mean by inversion of a mechanism? Explain with sketches all the inversions of single slider crank mechanism. Where these inversions are used?

OR

3 With a neat sketch, explain the working of Scott – Russell mechanism and modified Scott-Russel mechanism.

UNIT - II

4 Describe with a neat sketch the working of Davis steering gear mechanism. Also prove that for Davis steering gear $\tan\alpha = \frac{W}{2L}$.

OR

5 Determine the maximum power that can be transmitted using a belt of 100 mm x 10 mm with an angle of lap of 160°. The density of belt is $10^{-3}\ gm/mm^3$ and coefficient of friction may be taken as 0.25. The tension in the belt should not exceed 1.5 N/mm^2.

UNIT - III

6 In a four bar chain ABCD, AD is fixed and is 15 cm long. The crank AB is 4 cm long and rotates at 120 rpm clockwise, while the link CD (= 8 cm) oscillates about D. BC and AD all of equal length. Find the angular velocity of link CD when angle BAD = 60°.

OR

7 A link AB of a four bar linkage ABCD revolves uniformly at 120 rpm in a clockwise direction. Find the angular acceleration of links BC and CD and acceleration of point E in link BC. Given : AB = 7.5 cm, BC = 17.5 cm, EC = 5 cm, CD = 15 cm; DA = 10 cm and (BAD = 90°).

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UNIT - IV

8 A pair of spur gear with involute teeth is to give a gear ratio of 4:1. The arc of approach is not to be less than the circular pitch and the smaller wheel is the driver: The angle of pressure is $14\frac{1}{2}$ degrees.
(i) What is the least number of teeth that can be used on each wheel?

OR

9 What is the function of a differential gear in an automobile? Explain its working with a neat sketch.

UNIT - V

10 Differentiate between:
(a) Cam angle and pressure angle.
(b) Period of ascent and period of decent.

OR

11 Draw the profile of a cam operating a knife-edge follower (when the axis of the follower passes through the axis of cam shaft) from the following data:
(a) Follower to move outward through 30 mm with simple harmonic motion during 120° of cam rotation.
(b) Follower to dwell for the next 60°.
(c) Follower to return to its original position with uniform velocity during 90° of cam rotation.
(d) Follower to dwell for the rest of the cam rotation.

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