Code: 9D15102

M.Tech I Semester Regular & Supplementary Examinations January/February 2017

ADVANCED MECHANISMS

(Machine Design)

Time: 3 hours Max. Marks: 60

Answer any FIVE questions
All questions carry equal marks
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1 (a) Derive an equation for mobility or degree of freedom (DOF) for spatial mechanisms.
(b) What do you mean by spherical triangle and explain the sine rule and cosine rule for spherical triangles.

2 Derive Euler-Savary equation with respect to the inflection circle.

3 Driving link (input link) of a four bar mechanism revolves at a constant speed of 2 rad/sec, in counter clockwise direction. Determine, for output link the: (i) Angular velocity. (ii) Angular acceleration. (iii) Rate of change of angular acceleration. (iv) Radius of curvature of the polode. The following data refer to four bar mechanism.

Fixed link (AD) = 120 mm; Input link (AB) = 30 mm;
Coupler (BC) = 45 mm; Output link (CD) = 60 mm;
Angle DAB = 45°

4 (a) Explain the construction of Burmester curve with respect to guiding a body.
(b) Explain the properties of 'Rotocenter triangle', when guiding a body through three distinct points.

5 (a) Write a note on 'Hrones and Nelson Motion Atlas' related to path generation.
(b) Explain the Overlay's method of the synthesis of four bar function generator.

6 Synthesize (determine the lengths of links) a four bar linkage to generate $y = x^{1.6}$ in the interval $1 \leq x \leq 4$. The length of the largest link is 300 mm. Use three point accuracy of Chebyshe's spacing. The input link rotate from $30°$ to $120°$, whereas the output link rotates from $60°$ to $150°$.

7 (a) Why D-H convention does not give unique frame assignment for a given manipulator?
(b) Sketch and explain STANFORD ARM industrial robot manipulator.

8 What are the singularities of a manipulator? How are they classified and determined? Explain briefly.

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