R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH II - SEMESTER EXAMINATIONS, APRIL/MAY 2012
ADVANCED MECHANICS
(MACHINE DESIGN)

Time: 3hours   Max. Marks: 60

Answer any five questions
All questions carry equal marks

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1.a) Explain Grubler's and Kutzbas criteria's for plain mechanisms with the help of examples.
  b) Explain with the help of neat sketches the type of elements and joints used in robotic manipulator.

2.a) What is inflection circle? Explain the analytical procedure to find the inflection circle diameter.
  b) Derive the Euler – Savary 1st and 2nd forms of equations.

3.a) What is Circling – point curve? Find the radius of curvature for a circling point curve.
  b) Derive the polode curvature (general case) for fixed polode.

4.a) Explain in detail with the help of neat sketch how to design a four bar mechanism by guiding a body through three distinct positions.
  b) Explain the concept of Burmester's curve

5.a) Derive the Freudenstein's equation for a four mechanism constructed in a first quadrant.
  b) Design a 4-bar mechanism to generate $y = \log_{10}(x^2)$ in the range $1 \leq x \leq 3$, Assume suitable data.

6.a) Synthesize a 4-bar mechanism for specified instantaneous conditions using method of components.
  b) What is function generation? Explain how to synthesis a 4-bar mechanism using precision point approximation.

7.a) Explain the steps involved in the D-H method of assignment of co-ordinate frames.
  b) Selecting the link parameter table, perform the inverse Kinematic analysis of a spherical robotic manipulator

8.a) Derive the Jacobian matrix for the spherical Robotic manipulator.
  b) Find out the singularity locations of a spherical robotic manipulator.
                  Link parameter Table of spherical robot is

Link	a	α	θ	d
1	0	$+90^0$	0	d_1
2	0	-90^0	θ_2	0
3	0	0^0	θ_3	0

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