Mechanics of Machines for Automation
Exam Questoins and Answers

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1 **Rolling cylinder: schematic; definition of slipping and not-slipping conditions; degrees of freedom and constraint equations in the cases of slipping and not-slipping**

2 **3-wheel (tricycle) model with no slipping: schematic; degrees of freedom; constraint equation in velocity form; velocity field; equations describing the evolution of system configuration**

3 **Finite motion in 3D space: coordinate transformations; definition and properties of rotation matrices; elementary rotation matrices; non-commutativity of finite rotations; composition of rotation matrices. Describe with schematics and equations.**

4 **Finite motion in 3D space: coordinate transformations; definition of homogeneous transformation matrices; inverse of homogeneous transformation matrices; elementary homogeneous transformation matrices; composition of homogeneous transformation matrices. Describe with schematics and equations.**

5 **Infinitesimal motion in 3D space: rate of change of a vector and angular velocity; additive properties of angular velocity. Describe with schematics and equations**

6 **Infinitesimal motion in 3D space: vector derivatives with respect to different reference frames; angular acceleration; additive properties of angular acceleration. Describe with schematics and equations.**

7 **Infinitesimal motion in 3D space: vector second derivatives in different frames; rigid body velocities; rigid body acceleration. Describe with schematics and equations.**