

## 7. Homework in Nelinear mechanics, 13. 12. 2013

**Deadline, 20. 12. 2013**

VS<sub>i</sub> is i–th digit of **your** registration number. For registration number 26102734 are VS<sub>6</sub>=7, VS<sub>8</sub>=4.

**NALOGA 1:** Deformable body is rotated about an axis  $\vec{e}_\phi = \frac{\sqrt{3}}{3}(\vec{e}_1 + \vec{e}_2 + \vec{e}_3)$ . Angle of rotation is changing with time as a function of  $\phi(t) = at^2$ . Assume default data  $a = \frac{VS7+1}{100} \frac{\text{rad}}{\text{s}^2}$ .

We consider a moving within the time interval  $0 < t < 10$ . The particle  $P$  is in the initial undeformed state at the time  $t = 0$  at the point (1 m, 2 m, 4 m) (material coordinates of the particle  $P$  are  $x_1^0 = 1$  m,  $x_2^0 = 2$  m,  $x_3^0 = 4$  m). We will consider only the particle  $P$ !

At the time  $t = (VS8 + 1)$  determine:

- spatial coordinates of the particle  $P$ ,
- velocity of the particle  $\vec{v}$ ,
- acceleration of the particle  $\vec{a}$ ,
- material time derivative of the rotation matrix  $\dot{R}$ ,
- matrix  $\Omega$ ,
- angle velocity vector  $\vec{\omega}$ ,
- material time derivative of the matrix  $\Omega$  i.e.  $\dot{\Omega}$ ,
- angle acceleration vector  $\dot{\vec{\omega}}$ .