

ME 639 Introduction to Robotics
MID SEMESTER

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⑤ Ans Yes, z-axis are along joint axis
(axis of rotation in case of revolute & axis
of linear motion in case of prismatic joint).
So, other axis are aligned with respect to
z-axis by right hand Rule.

⑥ Ans Yes, In other positions in rigid body it
doesn't make any difference.

⑦ Ans Yes

⑧ Ans Yes, if we performed R_0^1, R_1^2, R_2^3 Rotations
then R_0^3 will be $R_0^1 \cdot R_1^2 \cdot R_2^3$.

⑨ Ans Yes. from above Q-8 ans.

$R_0^3 = R_0^1 \cdot R_1^2 \cdot R_2^3$ where R_0^1, R_1^2, R_2^3 are
orthogonal matrices so

$$R_0^3 \cdot R_0^{3T} = (R_0^1 \cdot R_1^2 \cdot R_2^3) \cdot (R_0^1 \cdot R_1^2 \cdot R_2^3)^T$$

$$= R_0^1 \cdot R_1^2 \cdot R_2^3 \cdot R_2^{3T} \cdot R_1^{2T} \cdot R_0^{1T}$$

$$\left[\because (AB)^T = B^T \cdot A^T \right]$$

$$R_0^3 \cdot R_0^{3T} = 1$$

$$\left[\because R_2^3 \cdot R_2^{3T} = 1, R_1^2 \cdot R_1^{2T} = 1, R_0^1 \cdot R_0^{1T} = 1 \right]$$

So R_0^3 is a orthogonal matrix with
determinant equal to 1.