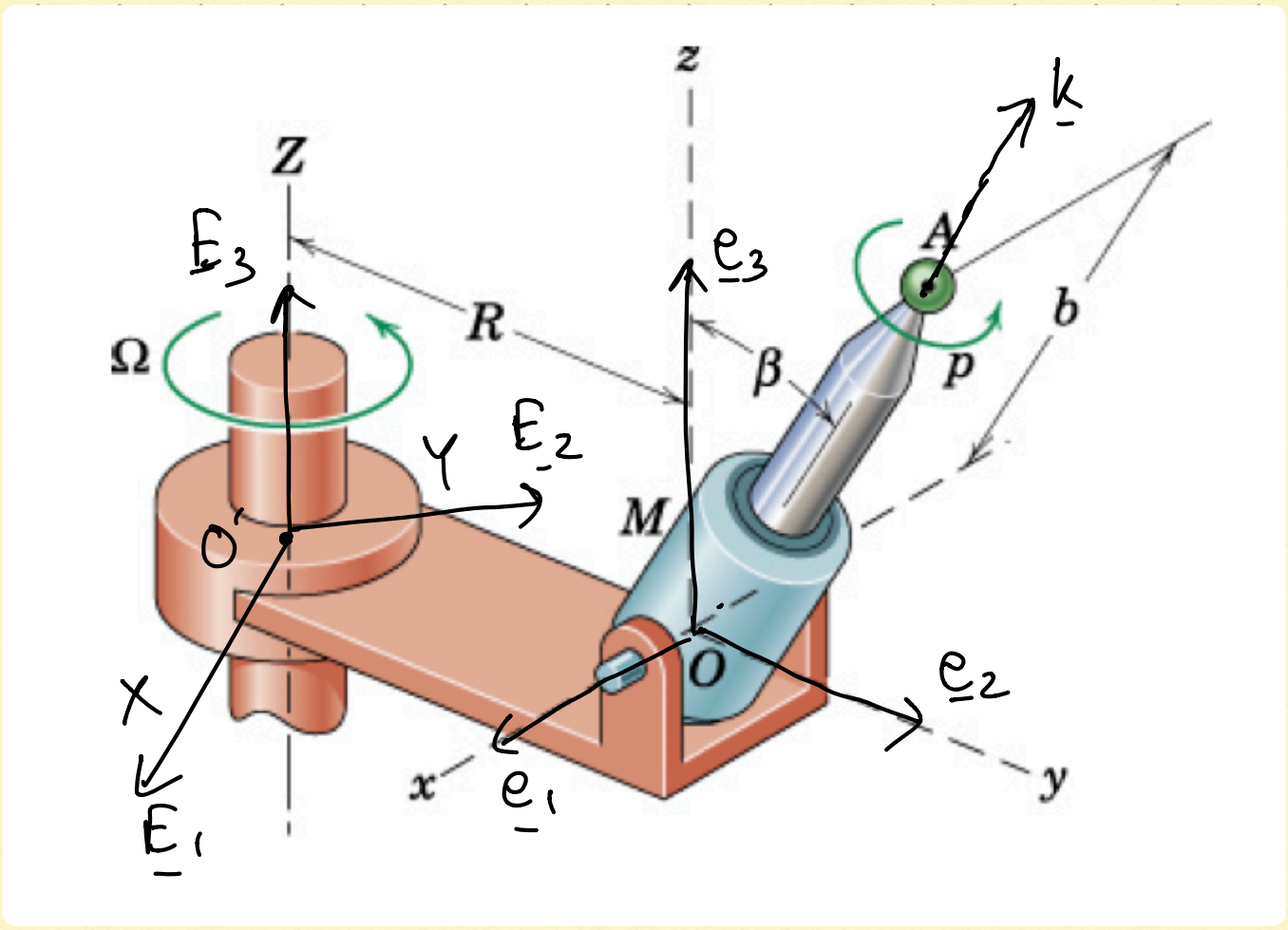

Angular velocity of OA:

$$\underline{\omega} = p\,\underline{k} - \dot{\beta}\,\underline{e}_1 + \Omega\,\underline{E}_3$$

$$\underline{k} = \sin\beta\,\underline{e}_2 + \cos\beta\,\underline{e}_3$$

$$\underline{E}_3 = \underline{e}_3$$

$$\underline{\omega} = -\dot{\beta}\,\underline{e}_1 + p\sin\beta\,\underline{e}_2 + (p\cos\beta + \Omega)\,\underline{e}_3 \leftarrow$$

$$\underline{\alpha} = \left(\frac{d\underline{\omega}}{dt}\right)_{XYZ} = \left(\frac{d\underline{\omega}}{dt}\right)_{xyz} + \underbrace{\underline{\Omega} \times \underline{\omega}}_{\downarrow\ \Omega\,\underline{e}_3}$$

$$\left(\frac{d\underline{\omega}}{dt}\right)_{xyz} = p\dot{\beta}\cos\beta\,\underline{e}_2 - p\dot{\beta}\sin\beta\,\underline{e}_3$$

$$\underline{\alpha} = -\Omega p\sin\beta\,\underline{e}_1 + \dot{\beta}(p\cos\beta - \Omega)\,\underline{e}_2 - p\dot{\beta}\sin\beta\,\underline{e}_3$$