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Corrigé type : Théorie des mécanismes **Master 1 :** Technique de production Industriel

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Réponse 1

	Liaison	Exemple
	Hélicoïdale	vis d'un serre joint
	Glissière	téléphone portable
	Liaison plan	plaquette de frein
	Linéaire	Roulement à rouuleau
	pivot	charnière de porte

Réponse 2

Solution :

$$* \{T\}_O = \begin{cases} \vec{R} = \sum_{i=1}^{4} V_i \\ \vec{M}_A = \sum_{i=1}^{4} \vec{r}_i \wedge \vec{V}_i \end{cases}$$

$$\vec{R} = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix} + \begin{pmatrix} 0 \\ 2 \\ 2 \end{pmatrix} + \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix} + \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \\ 1 \end{pmatrix}$$

$$\vec{M}_A = \vec{OA} \wedge \vec{V}_1 + \vec{OO} \wedge \vec{V}_2 + \vec{OB} \wedge \vec{V}_3 + \vec{OC} \wedge \vec{V}_4 .$$

$$\vec{OA} \wedge \vec{V}_1 = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 2 & 0 \\ 1 & -1 & 1 \end{vmatrix} = \vec{i}\,(2*1-0*(-1)) - \vec{j}\,(1*1-0*1) + \vec{k}\,(1*(-1)-2*1)$$

$$\vec{OA} \wedge \vec{V}_1 = \begin{pmatrix} 2 \\ -1 \\ -3 \end{pmatrix}$$

$$\vec{OO} \wedge \vec{V}_2 = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 0 & 0 & 0 \\ 0 & 2 & 2 \end{vmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$\vec{OB} \wedge \vec{V}_3 = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 1 \\ 1 & 1 & -1 \end{vmatrix} = \vec{i}\,(1*(-1)-1*1) - \vec{j}\,(1*(-1)-1*1) + \vec{k}\,(1*1-1*1)$$

$$\vec{OB} \wedge \vec{V}_3 = \begin{pmatrix} -2 \\ +2 \\ 0 \end{pmatrix}$$

$$\vec{OC} \wedge \vec{V_4} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 2 & 1 \\ 1 & 2 & -1 \end{vmatrix} = \vec{i}\,(2*(-1) - 1*2) - \vec{j}\,(1*(-1) - 1*1) + \vec{k}\,(1*2 - 2*1)$$

$$\vec{OC} \wedge \vec{V_4} = \begin{pmatrix} -4 \\ +2 \\ 0 \end{pmatrix}.$$

$$\vec{M}_A = \begin{pmatrix} 2 \\ -1 \\ -3 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} + \begin{pmatrix} -2 \\ +2 \\ 0 \end{pmatrix} + \begin{pmatrix} -4 \\ +2 \\ 0 \end{pmatrix} = \begin{pmatrix} -4 \\ 3 \\ -3 \end{pmatrix}$$

donc $[T]_o = \begin{Bmatrix} 3 & -4 \\ 4 & 3 \\ 1 & -3 \end{Bmatrix}$.

2/ Pour déduire $[T]_A$ de $[T]_o$ on utilise.

$$[T]_A = [T]_o + \vec{AO} \wedge \vec{R} = [T]_o - \vec{OA} \wedge \vec{R} = [T]_o - \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 2 & 0 \\ 3 & 4 & 1 \end{vmatrix}$$

$$= [T]_o - [\vec{i}\,(2*1 - 0*4) - \vec{j}\,(1*1 - 0*3) + \vec{k}\,(1*4 - 2*3).$$

$$= [T]_o - \begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix} = \begin{Bmatrix} \vec{R} \\ M_o - \begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix} \end{Bmatrix} = \begin{Bmatrix} 3 & -4+2 \\ 4 & 3-1 \\ 1 & -3-2 \end{Bmatrix} = \begin{Bmatrix} 3 & -2 \\ 4 & 2 \\ 1 & -5 \end{Bmatrix}.$$

3/ $[T]_o = [T]_B + [T]$.

$$[T]_B = [T]_o + \vec{BO} \wedge \vec{R} = [T]_o - \vec{OB} \wedge \vec{R} = [T]_o - \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 1 \\ 3 & 4 & 1 \end{vmatrix}$$

$$= [T]_o - [\vec{i}\,(1*1 - 1*4) - \vec{j}\,(1*1 - 1*3) + \vec{k}\,(1*4 - 1*3)$$

$$[T]_B = [T]_o - \begin{pmatrix} -3 \\ +2 \\ +1 \end{pmatrix} = \begin{Bmatrix} 3 & -4+3 \\ 4 & 3-2 \\ 1 & -3-1 \end{Bmatrix} = \begin{Bmatrix} 3 & -1 \\ 4 & 1 \\ 1 & -4 \end{Bmatrix}.$$

$$[T] = [T]_o - [T]_B = \begin{Bmatrix} 3 & -2 \\ 4 & 2 \\ 1 & -5 \end{Bmatrix} - \begin{Bmatrix} 3 & -1 \\ 4 & 1 \\ 1 & -4 \end{Bmatrix} = \begin{Bmatrix} 0 & -1 \\ 0 & 1 \\ 0 & -1 \end{Bmatrix}.$$

$[T] = \begin{Bmatrix} 0 & -1 \\ 0 & 1 \\ 0 & -1 \end{Bmatrix}$ est un couple.