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First name :
Last name :
Group :

Physics – 01
Academic year: 2025 – 2026
Time : 30 min

Micro Interrogation No. 02 (Groupe 3 and 6)

In the Cartesian system $(Oxyz)$ provided with an orthonormal basis $(\vec{\imath},\ \vec{\jmath},\ \vec{k})$, we consider the two following vectors:

$$\overrightarrow{V_1} = 4\,\vec{\imath} - 2\,\vec{\jmath} + 2\,\vec{k} \quad \text{and} \quad \overrightarrow{V_2} = \vec{\imath} - \vec{\jmath} + 2\,\vec{k}$$

1- Calculate the sum vector $\vec{S} = \overrightarrow{V_1} + \overrightarrow{V_2}$ and the difference vector $\vec{D} = \overrightarrow{V_1} - \overrightarrow{V_2}$.

2- Calculate the directional cosines of the vector $\vec{S}$.

3- Calculate the scalar product $\overrightarrow{V_1} \bullet \overrightarrow{V_2}$ and the vector product $\overrightarrow{V_1} \wedge \overrightarrow{V_2}$.

4- Deduce the surface area of triangle formed by the vectors $\overrightarrow{V_1}$ and $\overrightarrow{V_2}$.

5- Give the projection of the vectors: $\overrightarrow{V_1}/\overrightarrow{V_2}$ and $\overrightarrow{V_2}/\overrightarrow{V_1}$.

6- Calculate the moment of the vector $\vec{S}$ about a point $I\ (0, 1, 0)$.

Standard correction of Micro – Interrogation No 2, PHYSICS-1 (Section 1/2)

5 pts

$\overrightarrow{V_1} = 4\,\vec{\imath} - 2\,\vec{\jmath} + 2\,\vec{k}$
$\overrightarrow{V_2} = \vec{\imath} - \vec{\jmath} + 2\,\vec{k}$

1) Sum and Difference vectors $\vec{S}$ and $\vec{D}$

$$\vec{S} = \overrightarrow{V_1} + \overrightarrow{V_2} = 5\,\vec{\imath} - 3\,\vec{\jmath} + 4\,\vec{k}$$ 0.5

$$\vec{D} = \overrightarrow{V_1} - \overrightarrow{V_2} = 3\,\vec{\imath} - \vec{\jmath}$$ 0.5

2) The directional cosines of the vector $\vec{S}$.

$$\vec{u} = \cos\alpha\ \vec{\imath} + \cos\beta\ \vec{\jmath} + \cos\gamma\ \vec{k}$$ 0.25

$$\|\vec{S}\| = \sqrt{50} = 5\sqrt{2}$$

$$\vec{u} = \frac{\vec{S}}{\|\vec{S}\|} = \frac{5}{5\sqrt{2}}\,\vec{\imath} - \frac{3}{5\sqrt{2}}\,\vec{\jmath} + \frac{4}{5\sqrt{2}}\,\vec{k}$$

$$\begin{cases} \cos\alpha = \dfrac{1}{\sqrt{2}} \\ \cos\beta = -\dfrac{3}{5\sqrt{2}} \\ \cos\gamma = \dfrac{4}{5\sqrt{2}} \end{cases} \textbf{ or } \begin{cases} \cos\alpha = \dfrac{\sqrt{2}}{2} \\ \cos\beta = -\dfrac{3\sqrt{2}}{10} \\ \cos\gamma = \dfrac{2\sqrt{2}}{5} \end{cases}$$ 0.25 0.25 0.25

3) Scalar and vector product

$$\overrightarrow{V_1} \bullet \overrightarrow{V_2} = 10$$ 0.5

$$\overrightarrow{V_1} \wedge \overrightarrow{V_2} = \begin{vmatrix} \vec{\imath} & -\vec{\jmath} & \vec{k} \\ 4 & -2 & 2 \\ 1 & -1 & 2 \end{vmatrix}$$

$$\overrightarrow{V_1} \wedge \overrightarrow{V_2} = -2\,\vec{\imath} - 6\,\vec{\jmath} - 2\,\vec{k}$$ 0.5

4) The surface of a triangle

$$S_T = \frac{\|\overrightarrow{V_1} \wedge \overrightarrow{V_2}\|}{2} = \frac{\sqrt{44}}{2} = \sqrt{11}\ (u.s)$$ 0.5

5) Projection of vectors $\overrightarrow{V_1}$ on $\overrightarrow{V_2}$ and $\overrightarrow{V_2}$ on $\overrightarrow{V_1}$

$$\begin{cases} Proj_{\overrightarrow{V_2}}\,\overrightarrow{V_1} = \dfrac{\overrightarrow{V_1} \bullet \overrightarrow{V_2}}{\|\overrightarrow{V_2}\|} = \dfrac{10}{\sqrt{6}} = \dfrac{5\sqrt{6}}{3} \\ Proj_{\overrightarrow{V_1}}\,\overrightarrow{V_2} = \dfrac{\overrightarrow{V_1} \bullet \overrightarrow{V_2}}{\|\overrightarrow{V_1}\|} = \dfrac{5}{\sqrt{6}} = \dfrac{5\sqrt{6}}{6} \end{cases}$$ 0.5 0.5

6) The moment of the vector $\vec{S}$ about a point I (0, 1, 0)

$$\vec{M}_I(\vec{S}) = \overrightarrow{IO} \wedge \vec{S} = -\overrightarrow{OI} \wedge \vec{S} \quad ; \quad (\vec{S} \equiv \overrightarrow{OS})$$

$$= -4\,\vec{\imath} + 5\,\vec{k}$$ 0.5