Université Mohamed - KHIDER - BISKRA
Département de Génie Mécanique – Elasticity - 2025/2026
Responsable du Module : Pr. HECINI M.

Travaux Dirigés (**Série n°3**)

Exercise N° 1 :

The stress state at point P of a material is given by the tensor defined in the basis (e_1 , e_2 , e_3). Its representative matrix is :

$$\Sigma = \begin{pmatrix} 7 & 0 & 5 \\ 0 & 12 & 0 \\ 5 & 0 & 9 \end{pmatrix} \quad daN/mm^2$$

1°) Determine the principal stress and principal directions of Σ in P.
2°) Determine the spherical and deviatoric stress tensors for this stress state.
3°) Determine the components σ and τ of the stress vector in the direction of the first bisector of the plane (e_1, e_3).

Exercise N° 2 :

The state of stress at point *P* is given with respect to basis (e_1 , e_2 , e_3) by the following matrix :

$$\Sigma_p = \begin{pmatrix} 0.7 & 3.6 & 0 \\ 3.6 & 2.8 & 0 \\ 0 & 0 & 7.6 \end{pmatrix} \quad (daN/mm^2)$$

1°) Determine the principal stress and principal directions of Σ in P.

2°) Calculate the components of the stress applied at point P, on the facet whose normal has the direction cosine of $(\sqrt{3}/2\,, 1/2\,, 0)$.

3°) Decompose the stress tensor Σ into a spherical part and a deviatoric part.

Exercise N°03 :

Let, at point P of a material, be the stress tensor defined in the basis (e_1 , e_2 , e_3). Its representative matrix is :

$$\Sigma = \begin{pmatrix} 4 & k & k \\ k & 7 & 2 \\ k & 2 & 4 \end{pmatrix} \quad daN/mm^2$$

where k is a real number; σ_{III} = 3 daN/mm² et $\sigma_I = 2\sigma_{II}$

1°) Determine the principal stress of Σ in P.
2°) Determine the value of k.
3°) Decompose the stress tensor Σ into a spherical part and a deviatoric part.
4°) Determine octahedral tension and shear.