**Problem set 3:**

1- Consider the cylindrical pressure vessel shown below. Let P the internal pressure.
   
a) Find $\theta$ so that $\sigma_1$ becomes maximum.
   
b) Find $\theta$ so that $\sigma_2$ becomes minimum.

![Diagram of cylindrical pressure vessel](image)

2- Consider a thin filament-wound closed cylindrical pressure vessel. The vessel is of 63.5cm internal diameter and pressurized to 1.379MPa. Suppose that the thickness of the cylindrical pressure vessel is $h=2$cm. Find stress field in the material coordinates. Also find the strain components with respect to $(x,y)$.

$E_1=140$GPa, $E_2=10$GPa, $G_{12}=7$GPa, $\nu_{12}=0.3$.

![Diagram of filament-wound cylinder](image)

3- Consider the filament-wound tube subjected to a torque $T$ as shown here.
   
a) Find the general expression of $\varepsilon_1$, $\varepsilon_2$ and $\gamma_{12}$.
   
b) Find the general expression of $\varepsilon_3$. 

![Diagram of filament-wound tube](image)