1.

(a) tensile test , compressive test

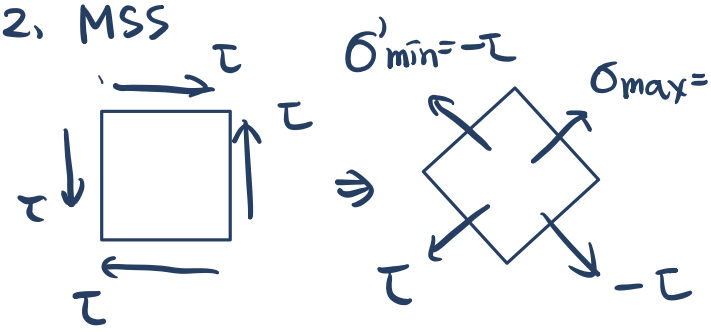
(b) $c_1 = \frac{S_t}{2}$, $c_2 = -\frac{S_c}{2}$

因它們分別為 tensile test 及 compressive test 所繪之莫耳圓，且兩圓皆切於 y 軸，直徑分別為 S_t & S_c，兩圓圓心位置為 $S_t/2$ & $-S_c/2$

(c) 圓B為 compressive test 所得之莫耳圓，在一般情況下，材料的 $|S_c| > |S_t|$，所以圓B會比圓A大

(d) 若試驗為特殊材料，且 $|S_t| > |S_c|$，則圓A會大於圓B

2. MSS



在 45° 角有 maxium shear stress

$\tau_{max} = \frac{\tau-(-\tau)}{2} = \tau$

$S_{sy} = S_y/2$

DE

$$\sigma' = \sqrt{\frac{(\sigma_1'-\sigma_2)^2+(\sigma_2'-\sigma_3)^2+(\sigma_3-\sigma_1)^2}{2}} = S_y$$

$$\because \begin{cases} \sigma_3' = 0 \\ \sigma_1' = \sigma'x \\ \sigma_2' = \sigma'y \end{cases} \Rightarrow \sqrt{\frac{(\sigma x-\sigma y)^2+\sigma y^2+(-\sigma x)^2}{2}} = S_y$$

for pure shear stress, $\sigma x = \tau = -\sigma y$, $\sigma'_3 = 0$

$\Rightarrow S_y^2 = 3S_{sy}^2 = 3\sigma_1^2 = 3\tau^2 \Rightarrow S_y = \sqrt{3}\tau$

3、

$S_{yt} = S_{yc} = 350\,MPa$

$\sigma_x = -50\,MPa,\ \sigma_y = -75\,MPa,\ \tau_{xy} = -50\,MPa$

$$\sigma_A, \sigma_B = \frac{-50-75}{2} \pm \sqrt{\left(\frac{-50+75}{2}\right)^2 + (-50)^2} = -11, -114\,MPa$$

$\sigma_1 = 0,\ \sigma_2 = -11,\ \sigma_3 = -114$

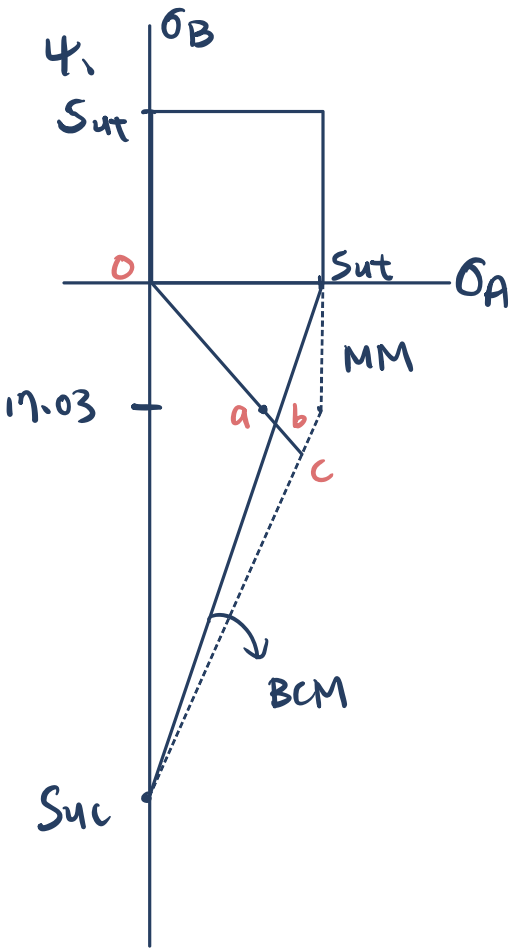
MSS: $n = \frac{350}{0-(-114)} = 3.07$

DE $\sigma' = 109\,MPa$

$$n = \frac{350}{109} = 3.21 \quad \#$$

DE can be more accurate #

4、



$$\sigma_A, \sigma_B = \frac{-15+10}{2} \pm \sqrt{\left(\frac{-15-10}{2}\right)^2 + (-15)^2}$$

$= 17.03,\ 22.03$

$n = \frac{OC}{Oa} = \frac{4.2}{2.8} = 1.5$ — MM

$n = \frac{Ob}{Oa} = \frac{3.35}{2.8} = 1.2$ — BCM

BCM: $n = \frac{1}{\frac{\sigma_A}{Sut} - \frac{\sigma_B}{Sut}} = 1.23$

MM: $n = \frac{1}{\frac{(Suc-Sut)}{Suc\,Sut}\sigma_A - \frac{\sigma_B}{Sut}} = 1.6$