CVL3211 : Quiz 1 Solution
Section C

Q.1 a In Figure 1, Y-axis and X-axis denotes σ_A/σ_Y and number of load cycle (n) respectively. Find σ_A for n=25 if $\sigma_A = 250MPa$. There is a major flaw in Figure 1, point it out.

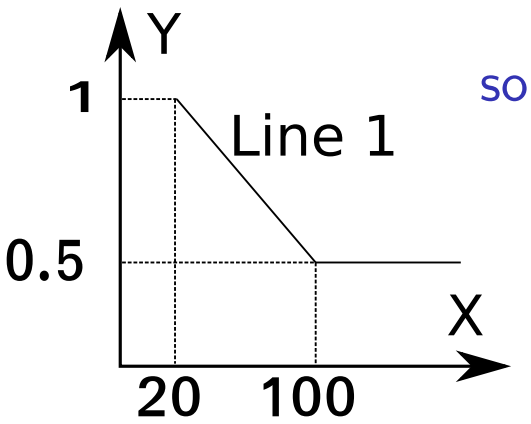

Figure: 1

solution Equation of the Line 1:
$y = mx + c$ for $(x, y) \equiv (20, 1), (100, 0.5)$
Putting these points in equation,
$1 = 20m + c$ and $0.5 = 100m + c$
from these we get, $m = -1/160, c = 9/8$ and X-axis is n and Y-axis is σ_A/σ_Y
we can write, $\sigma_A/\sigma_Y = -n/160 + 9/8 \equiv \sigma_A = \sigma_Y(-n/160 + 9/8)$
finding σ_A at n = 25 with $\sigma_Y = 250MPa$

answer $n_{25} = 242.1875MPa$.

First point from where the graph starts is given as (20,1). That means at $\sigma_A/\sigma_Y = 1$, number of cycles before breakage = 20. Physically that means a cyclic load equals to yield stress is applied 20 times till material fatigues (yields). That is a straight flaw and not possible.

CVL3211 : Quiz 1 Solution
Section A

Q.1 b For Figure 2, find Yield stress from extension method.

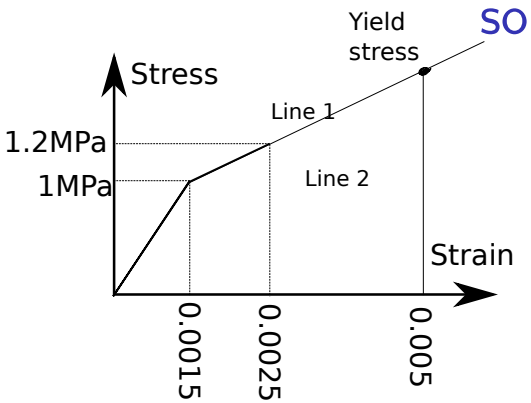

Figure: 1

solution Extension method : draw line with slope ∞ from $\epsilon = 0.5\%$ to cut stress-strain curve at yield point.
Equation of line 1 $= y = mx + c$
m=slope of elastoplastic part of curve = (1.2-1)MPa/(0.0025-0.0015) =200MPa
$c = y - mx$ with $(x, y) \equiv (1, 0.0015)$
$1MPa - 0.0015 \times 200MPa = 0.7MPa$
Yield stress = Stress at $\epsilon = 0.005$
Yield stress = 1.7MPa

Q.1 c Find modulus of resilience and toughness for Figure 2.

solution Modulus of resilience $= 0.5 \times 1MPa \times 0.0015 = 0.75KPa$

Toughness $= 0.5 \times 1MPa \times 0.0015 + 1MPa \times 0.0035 +$
$0.5 \times 0.7MPa \times 0.0035 = 5.475KPa$

Q.2 a What will happen if diameter of vicat's plunger in standard consistency test is increased? Explain.

answer Penetration will be decreased for same consistency if diameter is increased. Larger diameter will

b How capillary voids form in cement? How their volume changes with water-cement ratio?

answer Capillary voids formed from surface tension of water between cement particles. If W/C ratio decrease these voids will decrease but till an optimum W/C ratio.

c Write down compound which contributes most to cement composition. What will happen if its percentage is reduced in cement?

answer C_3S constitutes maximum in composition and if its content is reduced initial setting time will be lowered and initial strength will decrease.