وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الوسطى
المعهد التقني / الكوت
قسم الإنتاج

محاضرات

مادة (أجزاء مكائن) (Machine Parts)

الصف الثاني / إنتاج

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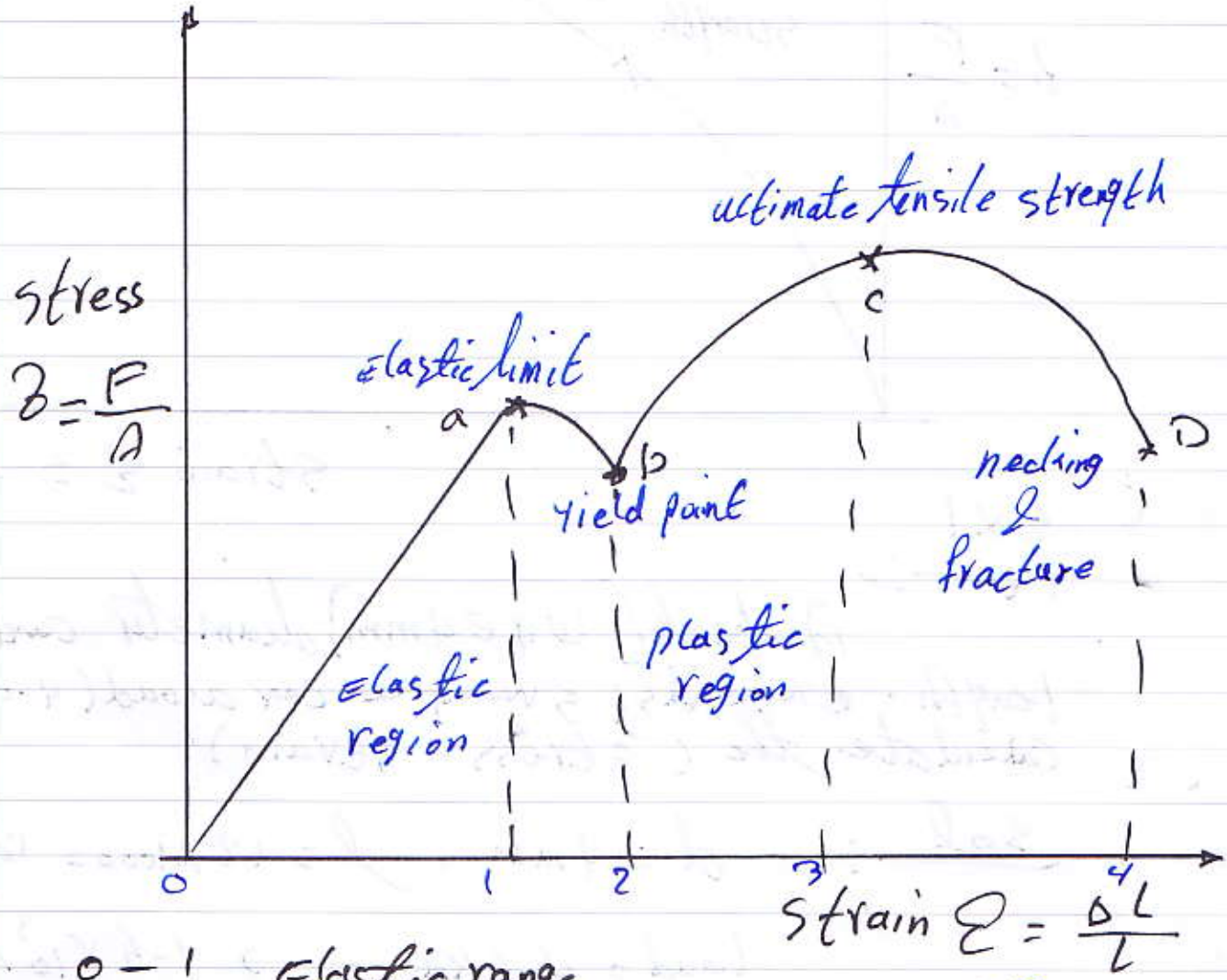
نعمه حافظ الحسيني

The name of Good

Stress - Strain Curve :-

① Ductile materials :-



0 - 1 Elastic range

a → Elastic limit

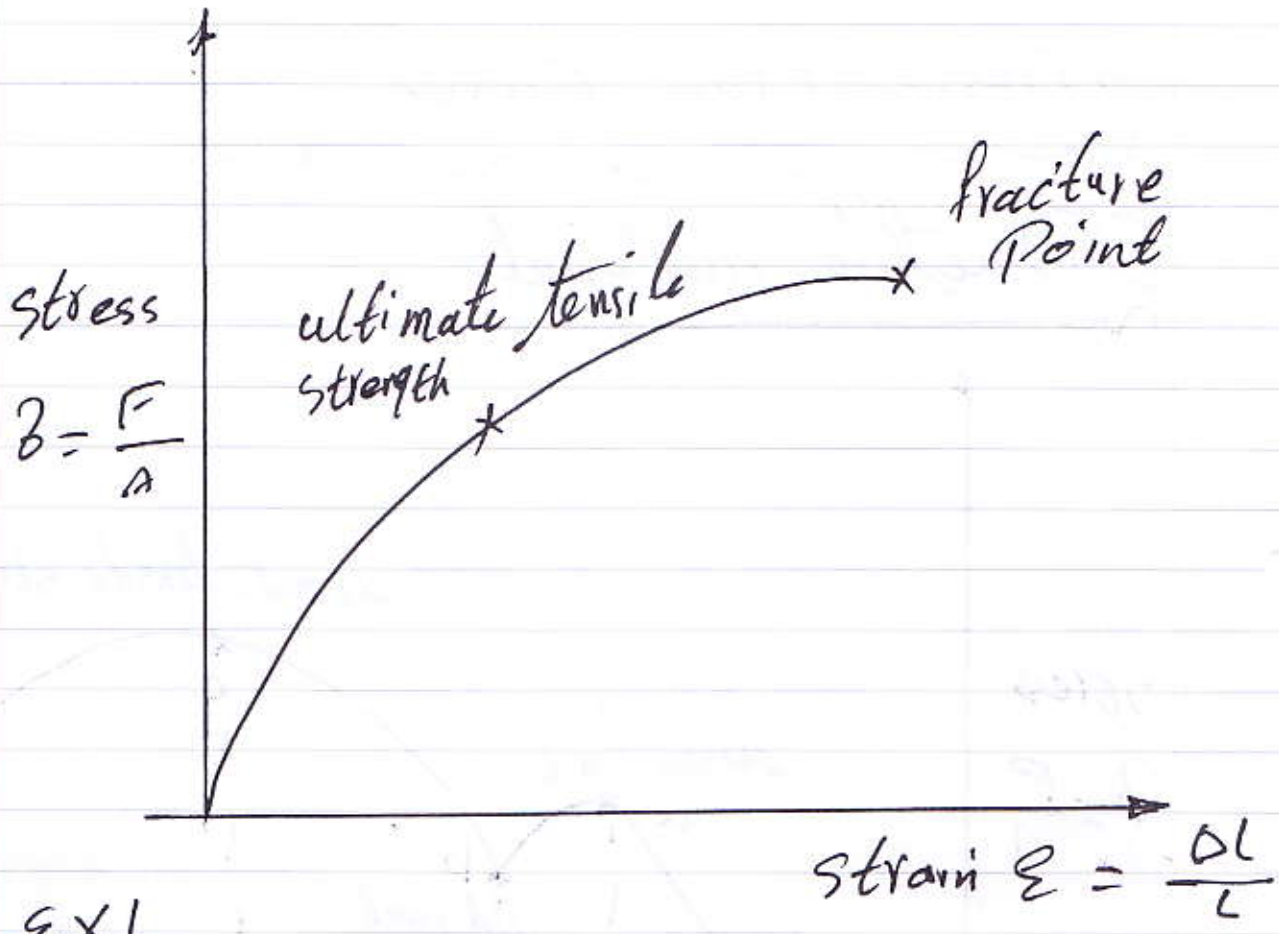
b → c plastic range

c - point of max Load.
point of instability.

3 → 4 - point (necking & fracture)

D - fracture of specimen (Sp)

Brittle materials :-



Ex1 :-

A steel (wire 4mm) diameter and (12m) length. extends (5mm) under a load (4-6 KN). Calculate the (stress - strain).

Sol :- $d = 4\,mm$ $\quad l = 12 \times 1000 = 12000\,mm$

$load = 4\text{-}6\,KN \longrightarrow 4\text{-}6 \times 10^3\,N$.

$$stress = \sigma = \frac{F}{A} = \frac{F}{\frac{\pi}{4}d^2} = \frac{4\text{-}6 * 10^3}{\frac{\pi}{4} * (4)^2}$$

$= \quad N/mm^2$

$$strain\ \varepsilon = \frac{\Delta L}{L} = \frac{5}{12000} = 0.00 = 0.0016$$

Ex 2

:- A steel (wire 6mm) diameter and (8m) length extends (5 mm) under a load of (3.6 KN). Calculate the stress & strain.

sol

:- $d = 6mm \quad l = 8 \times 1000 = 8000\ mm$

$load = 3.6\ KN \longrightarrow 3.6 * 10^3\ N.$

$$\text{stress } \sigma = \frac{load}{area} = \frac{load}{\frac{\pi}{4} d^2}$$

$$= \frac{3.6 * 10^3}{\frac{\pi}{4}(6)^2} = 11.8\ N/mm^2$$

$$\text{strain } \varepsilon = \frac{\Delta L}{L} = \frac{5}{8000} = 62 \times 10^{-4}.$$

Ex 3

:- A coil chain required to carry max load (50 KN). Find the diameter of the coil if the tensile stress (75 N/mm^2).

sol

:- $A = \frac{\pi}{4} d^2 = 0.7854\ d^2$

$$\sigma = \frac{F}{A} = \frac{50 * 10^3}{0.785\ d^2}$$

$$75 = \frac{50 * 10^3}{0.7854 * d^2}$$

$$d = 29.13\ mm \longrightarrow 30\ mm.$$

Ex 4

:- A rubber for machine is carry load (15 KN). and to compress (15 mm). under this load. if the stress in the rubber is ($280\ KN/m^2$). Find diameter and length of a rubber (used $E = 1\ KN/m^2$).

sol

:

$$\sigma = \frac{F}{A}$$

$$280 * 10^3 = \frac{15 * 10^3}{\frac{\pi}{4} d^2}$$

$$d = 0.150\ m \longrightarrow 150\ mm$$

$$\varepsilon = \frac{\Delta L}{L} = \frac{0.0005}{L}$$

$$E = \frac{\sigma}{\varepsilon} \rightarrow 1 = \frac{280 \times 10^3}{\frac{0.0005}{L}}$$

$$1 = \frac{280 * 10^3 * L}{0.0005}$$

$$L = 18\ mm$$

Ex2

~ :- A steel (6mm) diameter and (8 m) length. Extend (5 mm). under a load of (3-6 KN).

Find

~ stress & strain.

Sol

— :- $d = 6\,mm$ — $l = 8 * 1000 = 8000\,mm$

load = 3-6 KN → $3.6 \times 10^3\,N$.

$$\text{stress } \sigma = \frac{\text{load}}{\text{area}} = \frac{\text{load}}{\frac{\pi}{4} d^2}$$

$$= \frac{3.6 * 10^3}{\frac{\pi}{4}(6)^2} = 11.8\,N/mm^2$$

$$\text{strain } \varepsilon = \frac{\Delta L}{L} = \frac{5}{8000} = 62 \times 10^{-4}$$

Ex3

~ :- A coil chain required to carry max load (50 KN).

Find the diameter of the coil. if the tensile stress (7.5 KN/mm^2).

Sol :- $A = \frac{\pi}{4} d^2 = 0.7854 * d^2$

$$\sigma = \frac{F}{A} = \frac{50 \times 10^3}{0.785 d^2}$$

$$75 = \frac{50 \times 10^3}{0.785 d^2}$$

$$d = 29.13\,mm$$

Ex 4

: A rubber for machine is carry load (15 KN). and to compress (15 mm). under this load. if the stress in the rubber is (280 KN/m²).

Find

:- ① diameter & length of a rubber used E = 1 N/m²

Sol

: $\sigma = \frac{F}{A}$

$280 \times 10^3 = \frac{15 * 10^3}{\frac{\pi}{4} d^2}$

$d = 0.150$ mm.

$\varepsilon = \frac{\Delta L}{L} = \frac{0.0005}{L}$

$E = \frac{\sigma}{\varepsilon} = \frac{280 \times 10^3}{\frac{0.0005}{L}}$

$L = 18$ mm.