



Name: ..... Program ..... Mark

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**ATTEMPT ALL QUESTIONS**

1-a) Is the equation  $E=2G(3+v)$  dimensionally correct? Why? (E is the Young's modulus, G is the shear modulus and v is the Poisson's ratio). (4 marks)

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(b) Sketch a diagram for the Stress-Strain behavior of ductile materials. (4 Marks)

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(c) What force is required to stretch wire  $1\text{cm}^2$  in cross-section to double its length? (Young's modulus of elasticity =  $2 \times 10^{11} \text{ N/m}^2$ , Yield stress =  $3 \times 10^{11} \text{ N/m}^2$ ). (4 Marks)

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(4 Marks)

( $c_{\text{ice}} = 0.5 \text{ cal/g}^\circ\text{C}$ ,  $c_{\text{water}} = 1 \text{ cal/g}^\circ\text{C}$ ,  $L_f = 80 \text{ cal/g}$  and  $L_v = 540 \text{ cal/g}$ ). (4 Marks)

*Examiners: Prof. Abed Nasr, Prof. Somia Elhefnawy, A.Prof. Mirvat Abo-Elkhier, Dr. Hany Alnattar*



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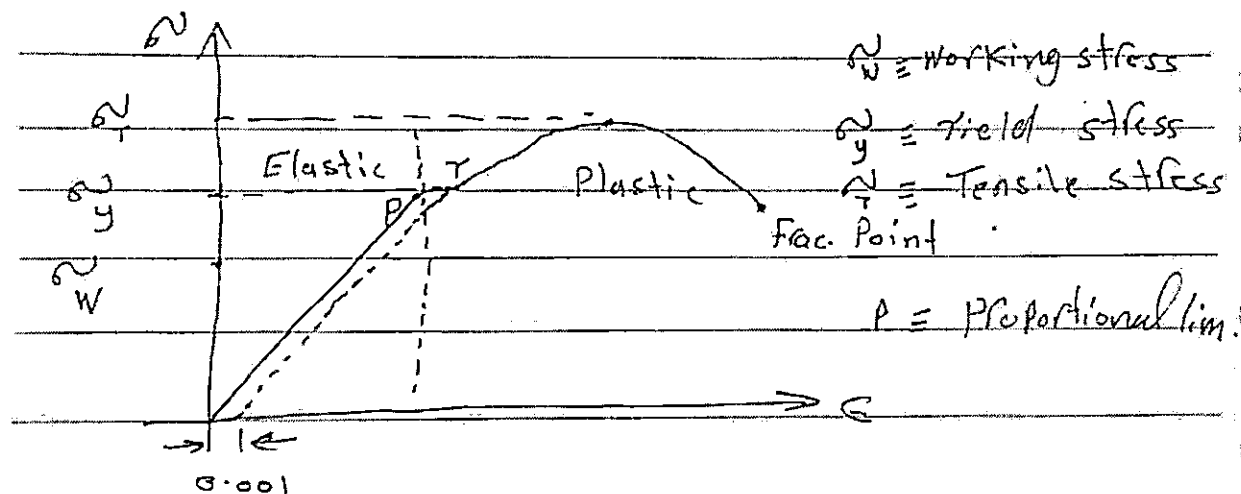
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ATTEMPT ALL QUESTIONS

- 1-a) Is the equation  $E=2G(3+v)$  dimensionally correct? Why? (E is the Young's modulus, G is the shear modulus and v is the Poisson's ratio). (4 marks)

Yes it's dimensionally correct, because  
it is dimensionless, so both sides has the dim. of  
modulus of Elasticity  $= ML^{-1}T^{-2}$  //

- (b) Sketch a diagram for the Stress-Strain behavior of ductile materials. (4 Marks)



- (c) What force is required to stretch wire  $1cm^2$  in cross-section to double its length? (Young's modulus of elasticity  $= 2 \times 10^{11} N/m^2$ , Yield stress  $= 3 \times 10^{11} N/m^2$ ). (4 Marks)

$$\because E = \frac{\sigma}{\epsilon}, \quad E = \frac{\Delta L}{L_0} \cdot \frac{L_0}{\Delta L} = 1 \quad \therefore E = \frac{\sigma}{\epsilon} = \sigma = \frac{F}{A}$$

$$\therefore F = EA = (2 \times 10^{11} \frac{N}{m^2}) (1 \times 10^{-4} m^2) = 2 \times 10^7 N //$$

(σ less than σ<sub>T</sub>)

2-a) What is the applications of Zeroth Law of Thermodynamics?

(4 Marks)

Two bodies are in thermal equilibrium if and only if they have the same temp. So, the applications of the law are:

- Temp. measurements
- Thermometers

(هذا سؤال مفتوح ومتعدد الاجابات، لابل (فيا سر تتركه لغير)

b) If 10g of steam at 100 °C is introduced into a mixture of 200g of water and 120g of ice. find the final temperature and composition of the mixture.

( $C_{ice} = 0.5 \text{ cal/g.}^\circ\text{C}$ ,  $C_{water} = 1 \text{ cal/g.}^\circ\text{C}$ ,  $L_f = 80 \text{ cal/g}$  and  $L_v = 540 \text{ cal/g}$ ).

(4 Marks)

The heat req. to melt the ice =  $m L_f = (120 \text{ g})(80) = 9600 \text{ cal} \rightarrow (1)$

The heat can steam give up =  $m L_v + m c \Delta T$   
 $= (10 \times 540) + 10(1)(100) = 6400 \text{ cal} \rightarrow$

The remaining ice =  $\frac{(9600 - 6400)}{80} = \frac{3200}{80} = 40 \text{ g}$

The final composition is  $(200) + (80) + (10) = 290 \text{ g Water}$   
 $+ 10 \text{ g ice}$

(290 g water + 40 g ice) at 0 °C //

Good luck

Examiners: Prof. Abed Nasr, Prof. Somia Elhefnawy, A. Prof. Mirvat Abo-Elkhier, Dr. Hany Alnattar