



1. (6 Points) Explain the difference between “Engineering stress” and “true stress”. How to calculate.

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2. (3 Points) Why does the specimen have to be shaped as shown in the figure below for tensile testing?



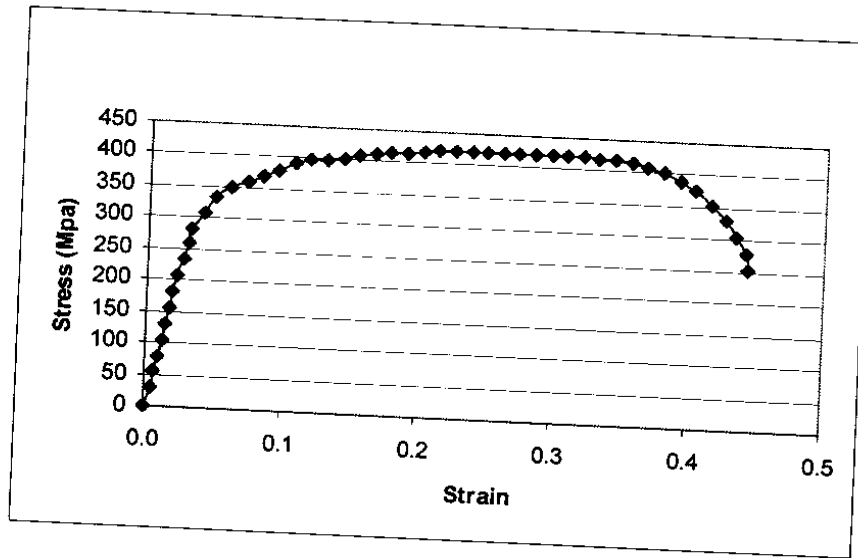
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3. (3 Points) In the tensile testing of two materials; diamond and rubber, which material will give higher value of Young’s Modulus? Why?

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4. (10 Points) To study the mechanical behavior and mechanical properties of steel, the tensile testing was performed and the results were shown in the figure and table below.



Tensile stress (Mpa)	Tensile strain
0.0000	0.0000
28.1796	0.0040
53.6698	0.0060
79.0373	0.0090
104.6663	0.0120
130.0818	0.0140
155.5476	0.0170
181.0302	0.0190
206.6140	0.0224
232.0515	0.0260
257.4595	0.0290
282.7493	0.0320
308.0348	0.0400
333.3182	0.0478
350.0000	0.0597
360.0000	0.0717
368.0000	0.0820
380.0000	0.0939
392.0000	0.1058

Tensile stress (Mpa)	Tensile strain
399.0000	0.1177
397.6644	0.1297
402.7895	0.1416
407.0940	0.1535
410.6647	0.1654
413.6171	0.1773
415.9125	0.1892
417.8226	0.2011
419.3913	0.2130
420.4700	0.2249
421.2904	0.2368
421.8318	0.2487
422.1061	0.2606
422.1135	0.2725
421.8923	0.2844
421.4151	0.2963
420.6865	0.3082
419.6931	0.3201
418.1602	0.3320

Tensile stress (Mpa)	Tensile strain
416.0912	0.3439
413.0738	0.3558
408.2165	0.3677
400.5174	0.3797
389.4209	0.3916
374.2585	0.4035
353.9670	0.4154
328.7437	0.4265
303.4698	0.4350
278.1956	0.4415
251.8059	0.4440

- a. Give the definition, the value and point it on the figure above.

Proportional limit,  $\sigma_{pl}$

Definition.....

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Value.....

Ultimate stress,  $\sigma_u$

Definition.....  
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Value.....

Fracture stress,  $\sigma_f$

Definition.....  
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Value.....

- b. If the gauge length of specimen,  $l_0$  is 28 mm., the initial cross section-area is  $6.5 \times 3 \text{ mm}^2$ , and the cross section-area at break is  $4.5 \times 1.9 \text{ mm}^2$ , explain and calculate;

Percent of area reduction

Definition.....  
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Calculate

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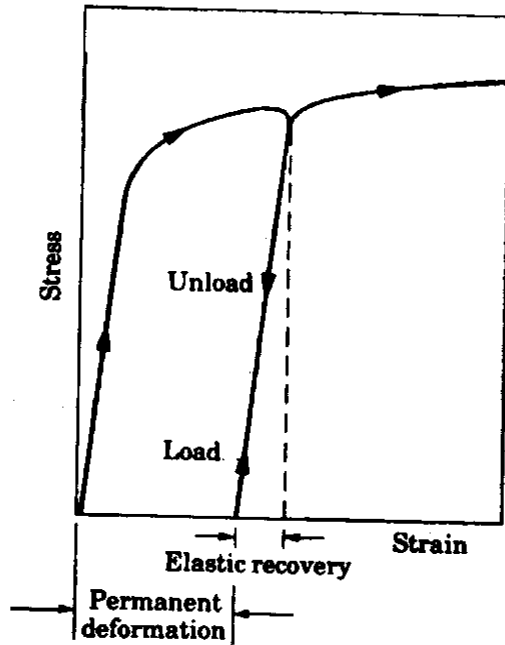
Modulus of elasticity, E

Definition.....  
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Calculate

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5. (3 Points) Based on the tensile testing of material, explain the result as shown in the figure below.



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6. Give the definition and example

(5 Points) Creep

*Definition*.....  
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*Example*.....  
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(5 Points) Stress Relaxation

*Definition*.....  
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*Example*.....  
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only **TWO** techniques.

- a. Strain gauge
- b. High Sensitivity Moiré Interferometry
- c. Digital Image Correlation

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**PART 2 : (อ.สมชาย)**

**INSTRUCTION:**

- Write your answers in the answer-book provided.
- There are 2 questions with the total score of 45.

Q1. (25 points) Answer the following questions;

- 1.1 How CIM related to Agile Manufacturing (AM) and World Class Manufacturing (WCM)?
- 1.2 Why the company needs to implement CIM?
- 1.3 There are 4 main data types required to be organized and used for the CIM company. Explain and give examples for each type in details.
- 1.4 In CIM, what's the meaning of 'integration'?
- 1.5 How are these 3 words related to each other?.....  
STEP....e-Manufacturing.....CIM.

Q2. (20 points) Answer the following questions;

- 2.1 Why are metal-matrix composites interesting?
  - 2.2 The reinforcing phase of a composite material is known as the embedded phase. It is most commonly one of the following shapes: a) fibers, b) particles, and c) flakes. Discuss the effects of each shape of the embedded phase.
  - 2.3 Specify 2-3 kinds of reinforcing fibers for PMC and its advantages.
  - 2.4 List a name of any biomaterials, explain its importance, and specify what you think about it.
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