TUGAS 1 FISIKA BAHAN

- Dikerjakan di kertas A4.
- Tulisan rapi dan terbaca jelas
- Gunakan alat bantu (kertas milimeter utk no 4, software excel utk no 3, gambar kurva stress strain digunakan untuk menentukan karakteristik yang dicari)
- Dikumpulkan dalam format pdf
- Due date tanggal 6 November 2022 pukul 22.00

1. Spesimen silinder dari paduan baja diberi perlakuan uji tarik sehingga diperoleh kurva stress-strain seperti gambar disamping. Diketahui specimen memiliki diameter 10,0 mm (0,39 inci) dan 75 mm (3,0 inc).
   a. Tentukan karakteristik apa saja yang bisa diperoleh dari kurva stress-strain tersebut.
   b. Tentukan elongation ketika beban 20.000 N (4500 lbf) diterapkan pada specimen tersebut

2. Spesimen paduan baja yang lain, memiliki penampang persegi panjang dengan dimensi 12,7 mm × 6,4 mm (0,5 in. × 0,25 in.) memiliki perilaku tegangan-regangan yang ditunjukkan pada Gambar 6.22. Spesimen ini dikenai gaya tarik 38.000 N (8540 lbf).
   a. Tentukan nilai regangan elastis dan plastis.
   b. Jika panjang awalnya adalah 460 mm (18,0 inci), berapakah panjang akhirnya setelah beban di bagian (a) diberikan dan kemudian dilepaskan?

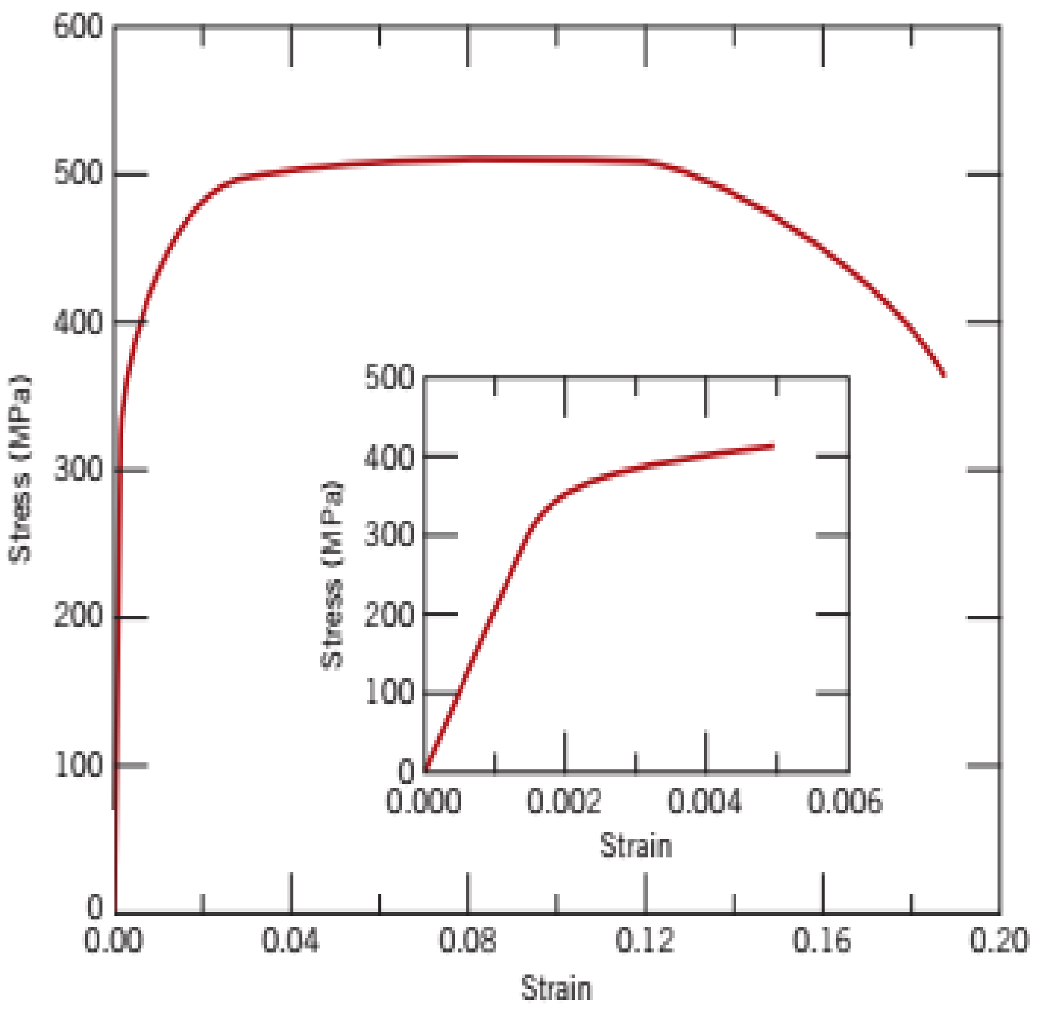

Figure 6.22 Tensile stress–strain behavior for a steel alloy.

3. A specimen of ductile cast iron having a rectangular cross section of dimensions 4.8 mm × 15.9 mm (3/16 in. × 5/8 in.) is deformed in tension. Using the load–elongation data shown in the following table, complete problems (a) through (f).

a. Plot the data as engineering stress versus engineering strain.
b. Compute the modulus of elasticity.
c. Determine the yield strength at a strain offset of 0.002.
d. Determine the tensile strength of this alloy.
e. Compute the modulus of resilience.
f. What is the ductility, in percent elongation?

Load		Length	
N	lb_f	mm	in.
0	0	75.000	2.953
4740	1065	75.025	2.954
9140	2055	75.050	2.955
12,920	2900	75.075	2.956
16,540	3720	75.113	2.957
18,300	4110	75.150	2.959
20,170	4530	75.225	2.962
22,900	5145	75.375	2.968
25,070	5635	75.525	2.973
26,800	6025	75.750	2.982
28,640	6440	76.500	3.012
30,240	6800	78.000	3.071
31,100	7000	79.500	3.130
31,280	7030	81.000	3.189
30,820	6930	82.500	3.248
29,180	6560	84.000	3.307
27,190	6110	85.500	3.366
24,140	5430	87.000	3.425
18,970	4265	88.725	3.493
Fracture			

4.

Table 6.3 Tensile Stress–Strain Data for Several Hypothetical Metals to Be Used with Concept Checks 6.2 and 6.4

Material	*Yield Strength (MPa)*	*Tensile Strength (MPa)*	*Strain at Fracture*	*Fracture Strength (MPa)*	*Elastic Modulus (GPa)*
A	310	340	0.23	265	210
B	100	120	0.40	105	150
C	415	550	0.15	500	310
D	700	850	0.14	720	210
E	Fractures before yielding			650	350

Concept Check 6.2 Of those metals listed in Table 6.3,

(a) Which will experience the greatest percentage reduction in area? Why?

(b) Which is the strongest? Why?

(c) Which is the stiffest? Why?

[*The answer may be found at www.wiley.com/college/callister (Student Companion Site).*]

5. Consider a thin-walled cylindrical tube having a radius of 65 mm that is to be used to transport pressurized gas. If inside and outside tube pressures are 100 and 1.0 atm (10.13 and 0.1013 MPa), respectively,
   a. compute the minimum required thickness for each of the following metal alloys. Assume a factor of safety of 3.5.
   b. A tube constructed of which of the alloys will cost the least amount?

Alloy	*Yield Strength, σ_y (MPa)*	*Density, ρ (g/cm^3)*	*Unit Mass Cost, $\bar{c}$ (\$US/kg)*
Steel (plain)	375	7.8	1.65
Steel (alloy)	1000	7.8	4.00
Cast iron	225	7.1	2.50
Aluminum	275	2.7	7.50
Magnesium	175	1.80	15.00

6. **Estimate the Brinell and Rockwell hardnesses for the following:**
(a) The naval brass for which the stress–strain behavior is shown in Figure 6.12.
(b) The steel alloy for which the stress–strain behavior is shown in Figure 6.22.

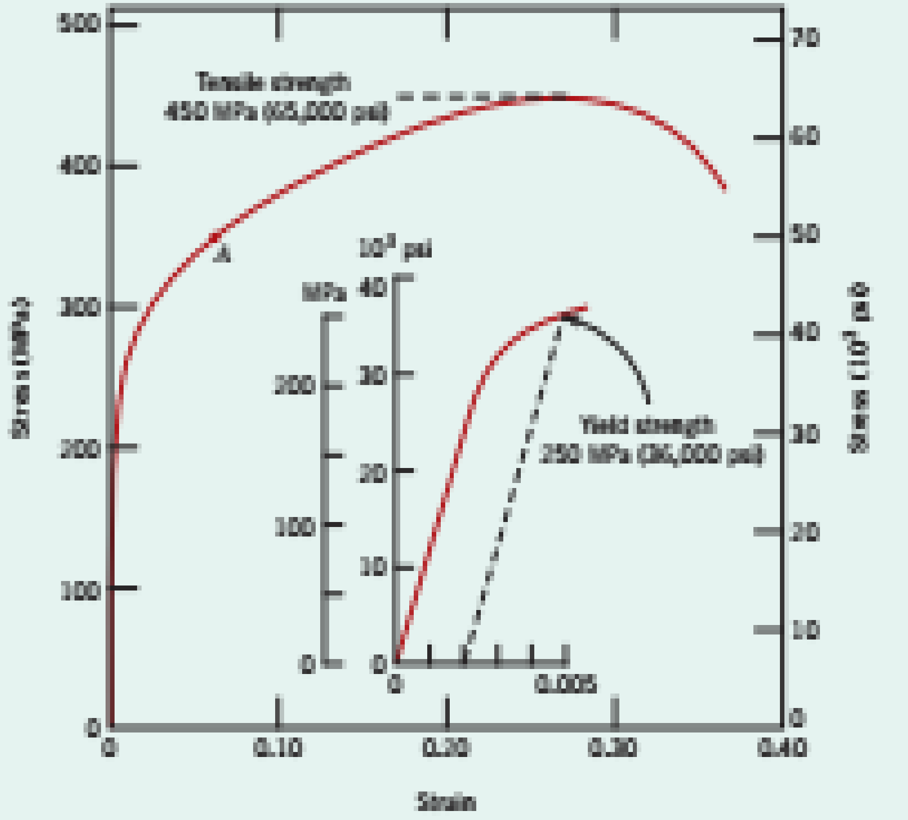

Figure 6.12 The stress–strain behavior for the brass specimen discussed in Example Problem 6.3.

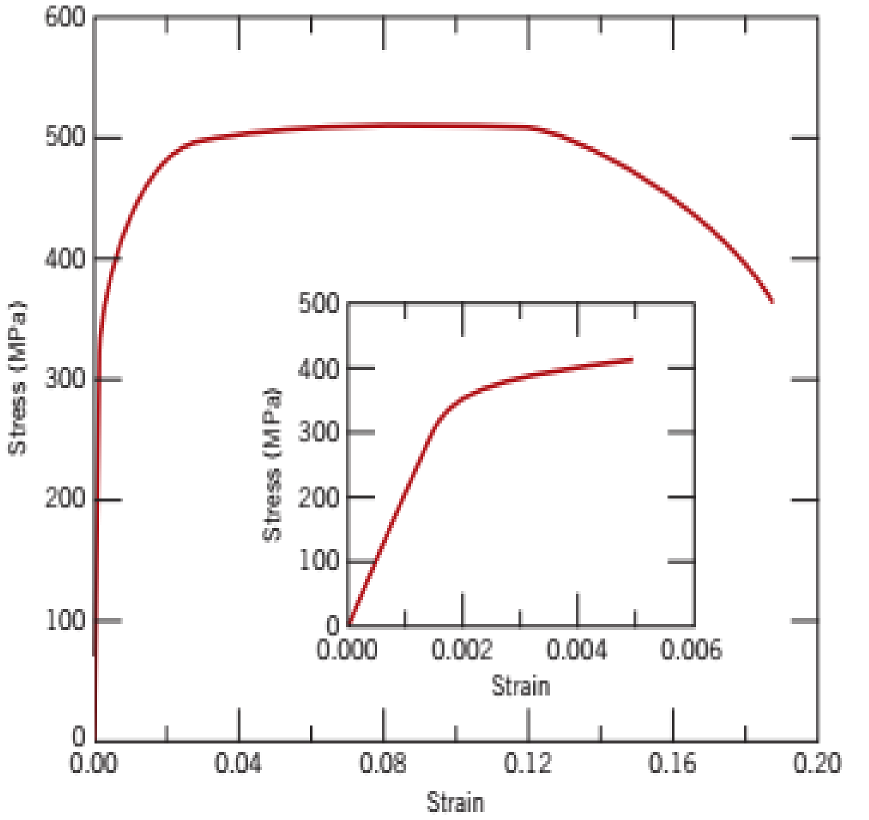

Figure 6.22 Tensile stress–strain behavior for a steel alloy.

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