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Structural
Mechanics
(Adda 6009)

Question 1

- a) The difference between thick and thin is thick walled can resist internal and external where as thin walled can only resist internal
- B) The ratio ~~is~~ for a thick walled ~~is~~ cylinder is $1/20$ of its internal diameter.
- c)

Question 2

$$a = c_c = \text{Critical dampening} = \sqrt{4MK}$$

$$w_n = \text{Natural frequency} = \sqrt{\frac{K}{M}}$$

$$\zeta = \frac{c}{c_c}$$

B)*

$$1 = \frac{1}{2\pi} \sqrt{\frac{10000}{5}} = 7.11 \text{ Hz}$$

$$2 = \sqrt{\frac{K}{M}} = 44.721$$

$$3 = c_c = \sqrt{4MK} = 447.21$$

$$4 \quad \frac{c}{c_c} = \frac{150}{447.21} = 0.3354 \text{ Nsm}$$

5

6

3a	0.1% Carbon	0.3% Carbon Steel
1	5500	5000
2		
3		
4	8000	10200
5		
6	32%	16%
7		

3b) By increasing the carbon content in steel it will increase the hardness and strength. ~~and~~ however increasing carbon will increase the brittleness and reduce the weldability.

3c)

1 - mild steel carbon content has upto 0.25% of its weight as carbon Properties

2 - Medium Carbon steel - will contain upto 0.8% of carbon, giving ductility as well as strength and also has good wear Resistance

3 - high Carbon steel - will have a carbon content of 0.55% or higher this means very high strength extremely hard wearing.

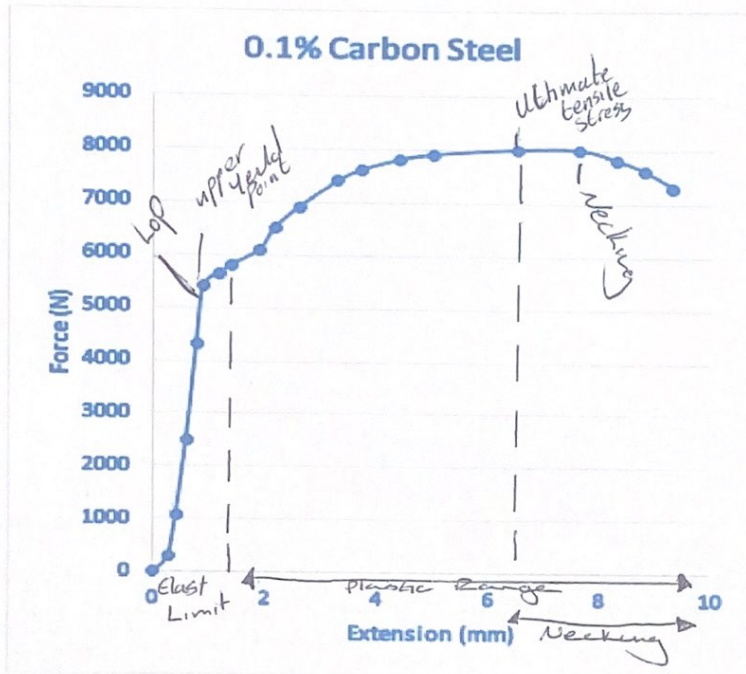
Question 3.

THIS PAGE MUST BE SUBMITTED WITH YOUR ANSWER BOOK

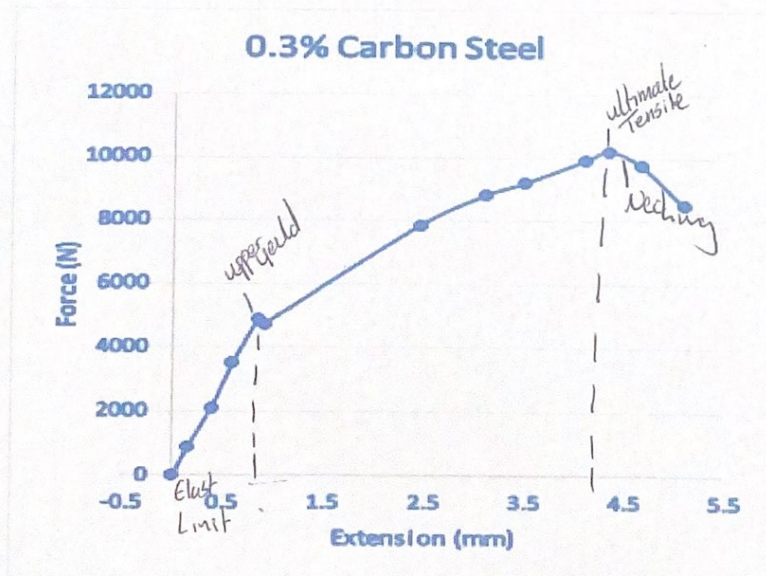
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Graphs for question 3



Load (N)	Ext (mm)
0	0
300	0.28
1080	0.42
2500	0.6
4300	0.78
5400	0.9
5650	1.19
5800	1.4
6100	1.9
6500	2.17
6900	2.6
7400	3.3
7600	3.7
7800	4.4
7900	5
8000	6.5
8000	7.6
7800	8.3
7600	8.8
7300	9.3



Load (N)	Ext (mm)
0	0
900	0.15
2100	0.38
3500	0.59
4900	0.85
4750	0.9
7850	2.45
8800	3.1
9200	3.5
9900	4.1
10200	4.35
9750	4.67
8500	5.1

END OF EXAMINATION PAPER

Question 4

a)

- 1- Normalising - Involves heating the steel to an elevated temperature followed by slow cooling to room temp to relieve stress.
- 2- Annealing - is a heat treatment process used mostly to increase ductility and reduce the hardness of a material. This change in hardness and ductility is a result of reductions of dislocations in the crystal structure of the material being annealed.
- 3- hardening - is a process of increasing the hardness of a material, the metal is heated and quickly cooled.
- 4- tempering - is the process of heating a substance to a temperature below the critical range holding and then cooling.

B)

Thermoplastic - By heating a polymer it will vibrate the molecules, if these molecules are not linked the molecule distance will increase as other forces will be reduced making the polymer softer so they can be reshaped by heating.

Thermoset - A material will be of soft doughy properties. They will set into a hard state by ~~initiate~~ initiating a chemical reaction by heating or mixing with a catalyst for this process it is called curing this makes the molecules become cross-linked making a rigid structure.

Elastomer - same as thermosetting however elastomers have a high degree of elasticity and can be stretched they will return to original shape. The knotted molecules will straighten when the material is pulled but will spring back when released.