

Sohag university
First year

Faculty of engineering
Civil Eng. Dept.

Strength & properties of materials 1
Tension Behavior and mechanical properties of reinforced steel bars

Question 1:-

A tension test was carried out on a steel specimen of 15mm diameter and 150mm length.
The results were as follow:

| | | | | | | | | | |
|---------|-----|-----|-----|-----|------|------|----|----|----|
| P (ton) | 3.8 | 7.6 | 7.5 | 8.5 | 11.5 | 12.5 | 13 | 12 | 10 |
| ΔL (mm) | .06 | .12 | 1.6 | 4.2 | 13 | 19 | 25 | 32 | 36 |

- What is the type of this specimen?
- Draw ordinary stress-strain diagram.
- Obtain the following: proportional stress-yield stress-ultimate stress-fracture stress-elastic modulus-resilience-toughness.
- Determine the secant and tangent modulus at load 9.5t.
- What will be the elongation for a short specimen of 20mm diameter from the same material at load 6t?

Question 2:-

The results of a tension test for long steel specimen of 12mm diameter were as follow:

| | | | | | | | | |
|--------|-----|-----|-----|-----|-----|----|-----|-----|
| P(ton) | 2.5 | 5 | 5 | 5.3 | 6.2 | 7 | 7.2 | 6.8 |
| ΔL(mm) | .6 | 1.2 | 1.4 | 2.8 | 9.2 | 19 | 40 | 48 |

Draw ordinary stress – strain diagram and determine:

Tensile strength – yield stress – stiffness – modulus of toughness – ductility – elongation corresponding to load 6.5t.

Question 3:-

Tension test was carried out on standard long specimen of 1.6cm diameter. the results were as follow:

| | | | | | | | | | | | |
|--------|------|-----|------|------|------|------|-----|------|------|------|-----|
| P(ton) | 1 | 2.8 | 5.2 | 6.3 | 7.2 | 8.8 | 9.4 | 9.85 | 10.4 | 11.2 | 10 |
| ΔL(mm) | .016 | .05 | .105 | .125 | .144 | .195 | .58 | 1.42 | 3.94 | 5.8 | 7.9 |

- Plot stress – strain diagram.
- Calculate: toughness and modulus of toughness – initial modulus of stiffness – secant modulus at load 9t – proof stress – proportional load – tangent modulus at load 8t.

Question 4:-

A tension test was carried out on a standard specimens of 25mm diameter.

| | | | | | | |
|------------|----|-----|-----|-----|-----|-----|
| Length | 80 | 160 | 240 | 320 | 400 | 480 |
| elongation | 38 | 28 | 25 | 23 | 22 | 21 |

- Draw the previous data with suitable scale and find the constants of elongation equation.
- Use these constants to predict the elongation of a standard long specimen from the same type having length of 200mm.