Objective

To find the compressive strength of materials using universal testing machine also draw stress strain curve.

Apparatus

Universal testing machine, Mild steel bar specimen, Vernier caliper

Theory

Compression Test

A compression test is a method for determining the behavior of materials under a compressive load. Compression tests are conducted by loading the test specimen between two plates and then applying a force to the specimen by moving the crossheads together. The compression test is used to determine elastic limit, proportionality limit, yield point, yield strength and compressive strength.

Compressive Strength

Compressive strength is the maximum compressive stress that a material is capable of withstanding without fracture. Brittle materials fracture during testing and have a definite compressive strength values. The compressive strength of ductile materials is determined by their degree of distortion during testing.

Structure components such as columns and structures are subjected to compressive load in applications. These components are made of high compressive strength materials. Not all the materials are strong in compression. Several materials, which are good in tension, are poor in compression. Many materials poor in tension are good in compression. Cast iron is one such example. This strength is determined by conducting a compression test. During the test, the specimen is compressed and deformation vs. the applied is recorded.

Compression test is just opposite in nature to tensile test. Nature of deformation and fracture is quite different from that in tensile test. Compressive load tends to squeeze the specimen. Brittle materials are generally weak in tension but strong in compression. Hence this test is normally performed on cast iron, cement concrete etc. But ductile materials like Aluminum and mild steel which are strong in tension are also tested in compression.

$$\text{Young's modulus} = \frac{\text{Compressive stress}}{\text{Compressive Strain}}$$

$$Y = \frac{\sigma}{\varepsilon}$$

$$\text{Ultimate compressive strength} = \frac{\text{Force just before rupture}}{\text{Cross Sectional Area of Specimen}}$$

$$\text{Percentage reduction in length} = \frac{\text{Initial Length} - \text{Final Length}}{\text{Initial Length}} \times 100$$

$$z = \%\Delta l = \left[\frac{l_f - l_0}{l_0}\right] \times 100$$

Procedures

- First Place the specimen in the jaws of the UTM
- Apply the load on the specimen.
- The specimen starts deforming as when applied load on it.
- Note the reading as we noted in previous experiment.

Observations & Calculations

Sr.No	Force	Displacement	Change in length	strain	stress	Modulus of elasticity
	N	mm	mm		KN\m^2	KN\m^2
1						
2						
3						
4						
5						
6						

Initial length=Lo=

Original diameter=Do=

Area=Ao

Procedure (Students' own words)

Difficulties / Suggestions

Concluding Remarks / Comments

Questions

1. **How to eradicate the errors?**

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2. **How to improve experimental procedure?**

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