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INU

MID Term Exam

Name

Salman Khan

I.D

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Subject:

Material Testing  
Repair & Maintenance

Instructor

Engr. Khushid  
Khan

B- Feeh

Civil

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Q No 01

## Why testing of materials are Required. & Types of materials.

Ans

Materials testing helps us to understand and quantify whether a specific materials or treatment is suitable for a particular application. Material testing may include methods that yield information about the structure or mechanical properties of material.

Mechanical properties are obtained by mechanical testing. Mechanical testing is used for developing design data, maintain quality control assisting in alloy development programs and providing data in failure analysis. Mechanical testing is usually destructive and requires test specimens of the material to be machined or cut to the specific shape required by the test method.

Two types of materials testing:

Destructive Test:

Result in the part of destroyed during control testing program.

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(A)

non-Destructive Test:

Is done in such a manner that the usefulness of the product or part is not damaged.

Types of material testing:

Tensile test, Compression test,  
Shear Load test, Hardness test,  
Brinell test, Vickers test, Rockwell  
Impact test, Izod test, Charpy test,  
Fatigue test, creep test.

Q No. 07  
(B)

Elaborate the test involved in  
determining the hardness and  
Toughness of materials

Ans.

Hardness is the ability to withstand indentation or scratches these consist mainly 3 types of test. Brinell hardness test, Rockwell hardness test, Vickers hardness test. Brinell hardness test uses ball shaped indenter. Ball may deform on very hard material. Cannot be used for thin materials. Surface area indentation is measured. Use square shaped pyramidal indenter. Accurate results. measure length.

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in materials science and metallurgy,  
Toughness is the ability of material to  
absorb energy and plastically deform  
without fracturing. one of material's  
toughness is the amount of energy  
per unit of volume that material  
can absorb rupturing



Q No. 02  
A

What is meant by non destructive tests? and the names of N-D-T method

Ans

In case of non-destructive tests, the specimens are not loaded to failure, non-destructive testing is considered to be a powerful method of evaluating existing concrete structures with regard to their strength and durability apart from assessment and control of quality of hardened concrete. These tests are also performed to determine the presence of internal cracks, micro cracks, and progressive deterioration in the concrete.

### N-D-T Methods:

- (i) Ultrasonic Testing (UT)
- (ii) Ultrasonic pulse velocity method
- (iii) Rebound hammer test.
- (iv) Radiographic Testing (RT)
- (v) Liquid Penetrate Testing
- (vi) Magnetic Particle Testing
- (vii) Electromagnetic Testing (ET)
- (viii) Ultrasonic pulse velocity test
- (ix) Rebound Hammer test.
- (x)

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Q No 02

(B)

Describe N.D.T test. Briefly explain and their advantages and disadvantages.

Ans

N.D.T Tests

Ultrasonic pulse velocity test.

Rebound Hammer test.

**Ultrasonic Pulse Velocity Test.**

It measures the time of travel of an ultrasonic pulse passing through the concrete. The apparatus for ultrasonic pulse velocity measurement consist of the following

- (a) Electrical pulse generator.
- (b) Transducers - one pair
- (c) Amplifier
- (d) Electronic timing device

=> Reflection Mode:

The transducer perform both the sending and the receiving of the pulsed waves as the sound is reflected back to device

=>

Attenuation Mode: In attenuation mode a transmitter sends ultrasonic through one surface, and a separate receiver

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=> detects the amount that has reached it on another surface after traveling through the medium.

## ∴ Rebound Hammer Test:

This is a simple hand tool, which can be used to provide a convenient and rapid indication of the compressive strength of concrete.

Concrete surface, Impact Spring.

Rider on guide rod, window and scale  
Hammer guide,

Release catch, Compressive Spring.

Locking button, Housing, Hammer mass

### Advantages:

- ✗ High penetrating power
- = High Sensitivity.
- = Greater accuracy
- = Some capability in estimating size, shape, nature of the flaws
- = Portability

### Disadvantages

- Manual operation requires careful attention by experienced technicians.
- Difficulty in inspecting the parts which are irregular.
- Requirement of the couplants
- Test objects should be water resistance

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Q No 03  
(a)

What is means by creep test?  
Where is creep test important.

Ans

All materials under constant stress and temperature will exhibit an increase of strain with time called creep. Creep is strain time at constant load and temperature. Metals usually creep and at temperature above  $0.3$  to  $0.4 T_m$ , where  $T_m$  is the absolute melting temperature of the metal.

example, Carbon steel starts creep above  $500^\circ\text{C}$  and Aluminum above  $100^\circ\text{C}$

**=> So Where creep is Important**

When a metal is subjected to high temperature, the creep is an important design consideration. In many mechanical applications like turbine blades, boiler, reaction or reactors, engine a designer must consider the creep.



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Q No 03  
(B)

Define Material Property!  
Elaborate Mechanical property  
of material.

Ans

Material Properties

1) Chemical Properties:

Composition (oxide or Compound)  
Acidity or Alkalinity  
Weathering  
Corrosion.

Physical Properties

Density Conductivity (thermal/electrical)  
Acoustical (Sound-transmission/absorption)  
optical Combustibility.

Mechanical

Strength (tension/compression etc) Toughness  
Stiffness, Elasticity, plasticity, ~~Ductility~~  
Ductility, Brittleness Hardness

Dimensional

Size and Shape.

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## Mechanical property

The properties of material that determine its behaviour under applied force are known as mechanical properties.

They are usually related to the elastic and plastic behaviour of the material. These properties are expressed as functions of stress strain, etc.

A sound knowledge of mechanical properties of materials provides the basis for predicting behaviour of materials under different load conditions and designing the components out of them.