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Assignment - 11

Non-Destructive Testing

Q1) What is NDT? State advantages of NDT as compared with destructive testing.

Ans: 1) NDT:- NDT is the technique which is used to determine the overall quality of the product without impairing the properties of the material.

2) This is done by low intensity sound waves which do not cause any change in the physical and chemical characteristics of the material under test.

3) The ultrasonic waves are propagated into the piece under inspection.

4) The defects such as cracks, cavity, flakes are detected by the reflection of wave at the interface in the object.

5) This is done without any damage to the piece under test.

II Advantages of Non-Destructive Testing are:-

1) This test is performed without making any physical or chemical change of the material.

2) It can access difficult penetration area of the material.

3) It is less expensive.

Q2) Discuss in brief applications of ultrasonics in flaw detection.

Ans I] Applications of ultrasonics in flaw detection are:-

- 1) The strength of the components play an important role in most of the engineering applications.
- 2) The strength of material is reduced due to the presence of any kind of defect in it. The defects can be as large as cracks or as tiny as cavities.
- 3) If the detection is tried by X-ray or  $\gamma$ -ray testing, the area of application is restricted and a large apparatus is needed. Hence, ultrasonic testing is employed which is cheap, reliable and convenient.
- 4) The pulse generator produces a radio frequency pulse of a few microseconds duration and it is then impressed on the crystal placed up against the material under test.
- 5) Ultrasonic waves are reflected from the flaws and from the opposite side of the material. The time elapsed between the pulse and reflection is noted by the deflection of spot on CRO. If the time taken by the reflected signal is less

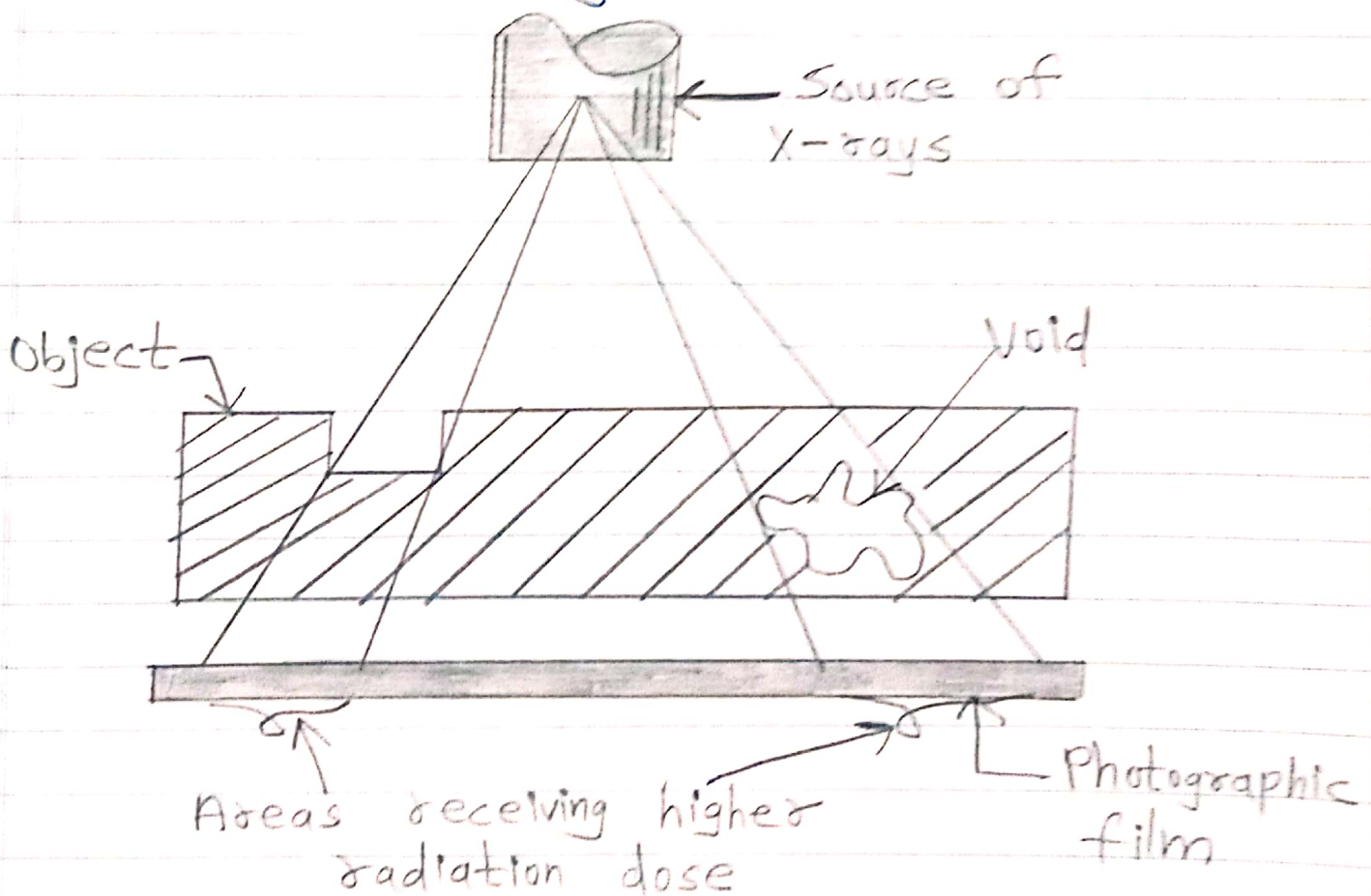


then the time taken for the standard sample, the material is treated as defective.

- 6.) Flaw detection method is also used to locate the flaws in plastic products.
- 7.) The ultrasonic waves can be easily aimed in one direction and can penetrate several feet of metal.

Q3.) Discuss in brief radiography testing and its applications.

Ans I] Radiography testing method:-



- 1) It is used to locate the position of bubbles, voids in grouting and in-situ measurement of density of concrete.
- 2) Depending on the quality of concrete material, we can use 2 types of radiation X-ray radiography and  $\gamma$ -ray radiography.
- 3) When radiation is incident on the material, it penetrates up to the varying degrees depending on the type of radiation, composition of the material and density of material. Also the loss of radiation depends on the type of material and thickness traversed.

### I) First step:-

Suitable X-ray or  $\gamma$ -ray is allowed to pass through the structure which is to be examined.

### 2) Second step:-

- i) Impressions of image of voids in grouting, damage in the structure and in situ density of concrete structure are obtained in the photographic plate.
- ii) In this way the portions of radiation penetrates through the material is recorded in the photographic film.





### 3) Third step:-

- i) Film is examined by different types of exposure. By close observation, the thickness and composition of material can be determined.
- ii) In the reinforced concrete rebars can be located.
- iii) This method is widely used in testing the quality of welding and casting.

### III Applications -

- 1) Applications vary depending on the type of material, size of part and inspection requirements, although industrial radiography and x-ray inspection are commonly used for testing welds, pipe, pipeline, concrete, machined parts and metal components, solid and flat materials.

2) The method of inspection is also used in following industries-

i) Aerospace

Ex:- Castings.

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ii) Medical devices.  
Ex:- Stints.

iii) Automotive.  
Ex:- Piston head.

iv) Military and Defense.  
Ex:- Ballistics.

v) Manufacturing.  
Ex:- Pre-production qualification of part.

vi) Packaging.  
Ex:- Structural integrity / leak or failure analysis.