Holography:

Holography is a remarkable application of laser in which interference, the wave phenomenon of light, is employed. A photography records a two-dimensional image of an object using ordinary light and is sensitive only to variations in intensity.

Holography is a technique of recording the whole information, that is, intensity and phase of an object. In Greek “Holo” means whole and “graphy” means recording or writing. In holography, the three-dimensional image of an object is recorded using laser and is sensitive to both intensity and phase variations.

In 1948, Dannis Gabor proposed a method to record both amplitude and phase of a wave by a technique called Wavefront construction (Hologram).

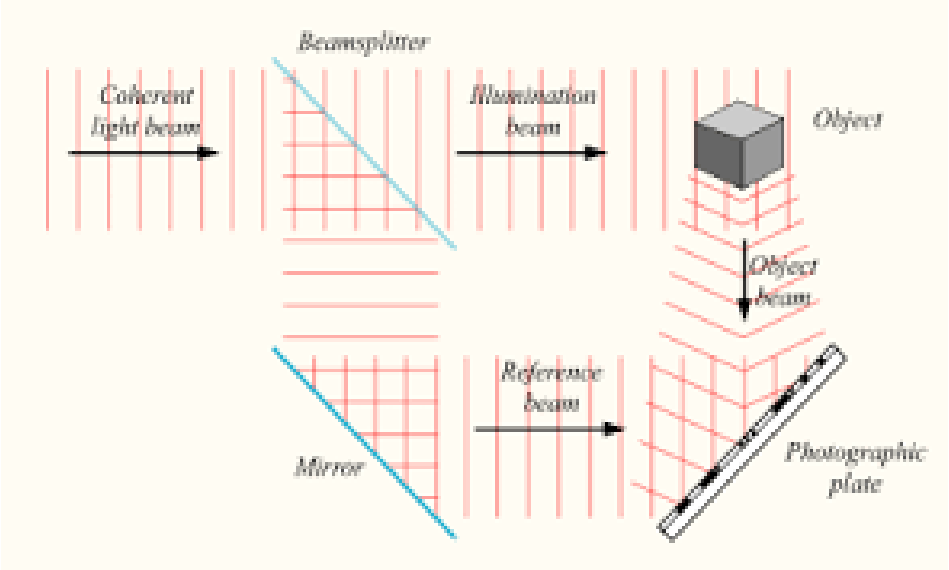
Construction of Hologram:

Principle: The Principle involved in the process of recording a holography is the superposition of two waves (an object wave an a reference wave) in a recording plate to produce an interference pattern.

Method:

1 A monochromatic laser beam is incident on a beam splitter. The beam is split into two beams.
2 One beam is directed towards the photographic plate which called the reference beam, as shown in figure -1.
3 Another beam is directed towards the object. The light is reflected from the object and reaches the photographic plate.
4 The reference beam and the object beam interfere with each other and produce the interference pattern.

Figure-1 Construction of Hologram

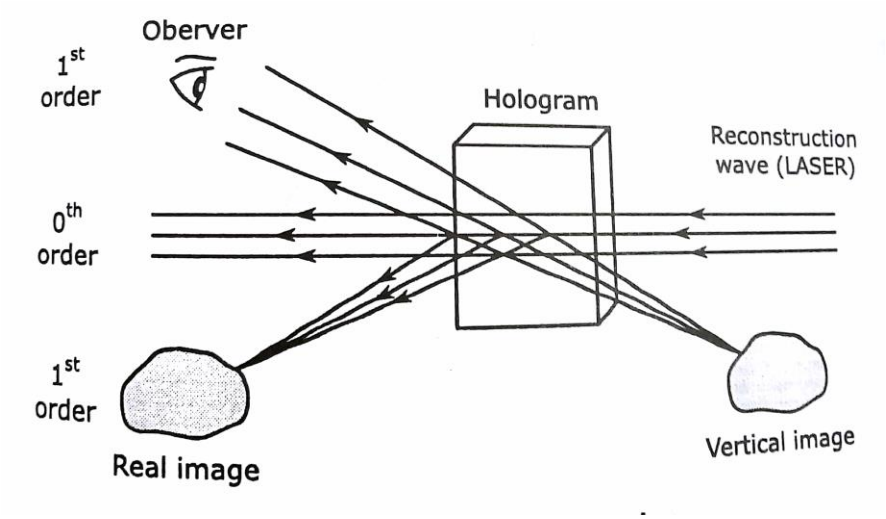


5 The High resolution photographic plate which has the recorded interference pattern is known as Hologram.

6 The interference pattern has recorded both the amplitude variation and phase of the object.

Reconstruction of a Hologram:

1 The hologram is first illuminated by means of a beam identical to the reference beam used for recording the hologram as shown in figure -2.



2 When the beam illuminates the hologram, it acts like a diffraction grating producing secondary waves containing several wave components which interfere to produce image of the object.

3 The light from the hologram forms a real image in front of the hologram and a virtual image behind the hologram. The virtual image is actually viewed by the observer.

4 The reconstructed image is in 3D form and as in the original object, the object can be looked around perceiving all its details.

Applications:

1 It is used in data storing system

2 It is used in producing a 3 D image of an object

3 It is used in studying the distribution of strain in an object subjected to stress

4 It is used in scanners

5 It is used in displaying 3D images.